INTERNATIONAL TECHNOLOGY TRANSFER: A SURVEY OF RECIPIENT FIRM EXPERIENCES IN BRAZIL

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Chapter 1. The Purpose and Organization of the Study

1.1 Introduction

Codes of conduct for regulating the international transfer of technology have become fashionable among developing countries in the 1970's at the national level (e.g. in Brazil, Mexico, and Argentina) as well as the regional level (the Andean Pact, or the Cartagena Agreement). Multilateral forms of such regulations are also currently under active debate as part of the 'North-South dialogue' and in several international organizations, among them the United Nations Conference on Trade and Development (UNCTAD), the United Nations Commission on Transnational Corporations, the Organization of American States (OAS), the Organization for Economic Cooperation and Development (OECD), and the World Industrial Property Organization (WIPO).

Generally speaking, these codes are aimed at improving the terms under which developing countries are getting their technologies from abroad by reducing the costs, unbundling technology packages, and eliminating restrictive conditions that hinder diffusion, production or distribution. When viewed in a larger context, and indeed sometimes self-proclaimed, these codes represent an important part of the efforts by developing countries to further their technological and economic developments, and to strengthen their control over the behavior of multinational corporations (MNC's) entering or operating within their boundaries.

While debates are still going on in various international fora concerning the substance and desirability of such regulations over technology transfer (see S. Holland 1976, for example), the actual results of their application in some developing countries are not yet well documented. Most of the recent literature on the subject of international technology transfer to developing countries are theoretical discussions from various analytical perspectives. Some view the problem as essentially one of political economy (e.g. C. Cooper 1973, O. Sunkel 1971); or one of economics (e.g. A. Sen 1968, F. Stewart 1972); or one of bargaining between MNC's and developing countries (e.g. C. Vaitsos 1971, P. Streeten 1973, and R. Vernon 1971). Perhaps stemming largely from the recentness of the implementation of these codes of regulation (mostly in the early or mid 70's) and inherent difficulties in obtaining empirical data, there are few studies based on

analyses of actual behavior of firms operating under these codes and the characteristics of the technology transfer agreements so processed (one such study is R. Robinson 1976).

As a result, there are many unanswered questions concerning how these codes are administered by the host governments, whether their implementations are successful, and what might account for their success or failure.

1.2 Purpose of the study

This study is an attempt to fill part of this gap by using Brazil as a case study to evaluate the impact of host government control on commercial transactions of technology transfer. Underlying the study are two basic and related hypotheses:

a. There are substantial gaps between stated objectives and the implementation of the control system (i.e. the regulations are not very effective in controlling technology transfer as intended).

b. The control system is less effective in dealing with local subsidiaries of foreign firms than with Brazilian-controlled local firms.

This empirical investigation will therefore address the following questions:

- What are the rules and regulations of Brazil's "code of conduct" for technology transfer?
- How do the rules differ according to the ownership of the regulated firm, i.e. at whom are the regulations directed?
- Who is responsible for implementing and enforcing them, and how?
- What, in fact, has been the implementation experience?
- How do local recipient firms (foreign-controlled versus Brazilian-controlled) behave under the control system?

It is hoped that this study will contribute to better understanding and, perhaps, improved design of control systems for international technology transfer to developing countries.

1.3 Organization of the study

The rest of this paper will be organized into four chapters. Chapter two will describe the Brazilian control system for technology transfer -- the policies,

the regulations, and administering mechanisms.

Chapter three will highlight characteristics of the technology agreements processed under the system. This data base was compiled by the author and represents all the technology agreements processed by the controlling agency since its inception till July 1975, when it stopped publishing details concerning individual agreements for unknown reasons. A comprehensive analysis of the 4500 or so technology agreements in this data base will be part of a forthcoming doctoral thesis by the author and will not be included here. Instead, a brief commentary and several tables of statistics will be presented to illustrate the stratified population from which the survey sample was drawn. Later on in Chapter five, references will be made to these technology agreements to help support or qualify some of the generalizations based on observations from the sample survey. The rest of Chapter three will discuss the sampling procedure, the questionnaire, and the interviews.

Chapter four will highlight the results from the sample survey of forty-nine recipient firms in Brazil (25 locally-controlled and 24 foreign-controlled) concerning their technology transfer activities and their experience with the government control system. Individual sections will be devoted to local technical activities of the firms (both in-house and from other local sources); cases of technology transfer from abroad; pre-registration search and evaluation activities for technology suppliers; the process of registering the technology transfer agreements with the controlling agency; and post-registration experiences with the control system. Comparisions between locally-controlled and foreign-controlled firms in the sample will be made throughout.

Chapter five will then examine the two hypotheses stated earlier in the light of major conclusions from the survey. That is, an assessment will be made as to whether the implementation of the control system has been effective relative to its stated goals, and how the relative effectiveness of control vary with the ownership control of the recipient firm.

Chapter 2. Characteristics of the Government Control System

2.1 Policies for foreign direct investment

2.2 Policies for foreign technology transfer

2.3 Control mechanism for entry of foreign investment capital

2.4 Control mechanism for entry of foreign technology

Chapter 2. Characteristics of the Government Control System

Since foreign direct investment and contractual agreements are substitutory and often complementary channels for the international transfer of technology, a description of the control system for technology transfer must include both.

2.1 Policies For Foreign Direct Investment

Brazil has one of the most open and favorable policies towards foreign investments among developing countries. Brazil is a traditional receiver of foreign investments and there are no official restrictions on its inflow except that exploration, extraction and refining of petroleum, domestic airlines, communications, publishing and coastal shipping are restricted to 100% Brazilian-owned enterprises, while partial foreign participation is permitted in mining, fishing, hydroelectric power, banking and insurance. The only requirement for foreign investment is that it must be registered with FIRCE (Department of Supervision and Registration of Foreign Capital) of the Central Bank. Profit remittance abroad is limited to 12% (16% when not counting 25% withholding tax on the remittance) of registered investment. Beyond that limit, a supplementary income tax up to 60% will be levied on the remittance. There are no discriminatory treatments between foreign and national firms except that royalty payments are not permitted between a foreign subsidiary (defined legally as 50% or more of whose voting equity is owned directly or indirectly by a foreign entity) and its parent company and technical assistance fees between such parties are taxed at 30%, the same rate as profit remittances. Furthermore, a foreign subsidiary cannot obtain long-term local financing from government sources and government guarantees against international loans, unless the investment is considered by CDI (Industrial Development Council) of the Ministry of Industry and Commerce as high priority for the national economy. This last handicap can be significant as fiscal incentives granted by CDI can lower the cost of fixed assets by 50%.

Implicit within this open policy towards foreign investments are perhaps three major goals. First of all, Brazil needs the substantial inflow

of foreign investments to finance its industrial development and to maintain a high rate of GNP growth. Substantial direct investments are also made by the government to offset insufficient capital formation from local private sources and to counter-balance the foreign presence. Secondly, Brazil needs the foreign technology that accompanies the flow of foreign direct investment. Thirdly, the flow of direct investment capital, in addition to huge inflows of official loan capital, is perhaps needed to help finance Brazil's large balance of payments deficit in the current account, especially in the last few years.

However, there are recent indications that Brazil is seeking to have tighter control over foreign investments, despite continued encouragement of its inflow. Official guidelines for foreign direct investment are given in the second National Development Plan 1975-79, which states that "It becomes ever more important to define clearly how foreign enterprises should be situated within national development strategy, and to have at hand instruments to implement the orientation decided upon." The government expects foreign investment to:

- Develop new export markets not traditionally serviced by Brazil;
- Contribute further to technological development by performing R&D locally and buying local machinery and equipment;
- Refrain from controlling the market, either by restraint of trade or buying out local competitors; and
- Transfer technology and develop local management capacity.

On the other hand, the plan states that the government will attempt to diversify the sources of foreign investment and use incentives and disincentives rather than restrictive legislation to achieve its objectives.

2.2 Policies For Foreign Technology Transfer

The policies towards foreign technology transfer were recently stated in the first Basic Plan for Scientific and Technological Development (PBDCT 1973/74). As a general approach, the transfer of technology from abroad is to be speeded up and oriented properly alongside with efforts to strengthen the capacity for internal technological innovation. The policy for techno-

logy transfer is to be based on:

- Definition of priority sectors according to product/process nature, significance for national development and possibilities of domestic solution of technological problems;
- Reduction of costs of importing technology to reduce the exchange deficit in the technological balance of payments;
- Improvement of knowledge of the world supply of technology to strengthen the bargaining position of Brazilian enterprises;
- Flexible application of the world patent system; and
- Removal of barriers to local absorption and dissemination of imported technology through elimination of contractual restrictions in technology transfer agreements.

In 1971, INPI (the National Institute of Industrial Property) was established under the Ministry of Industry and Commerce to replace the old patent office. INPI's main functions are to administer the norms and legislations regulating trademarks, patents, and technology transfer agreements. With respect to regulating the registration of technology transfer agreements, which include licensing agreements for patents and trademarks as well as technical assistance agreements, INPI established the following guidelines:/1

- To favor importation of technology over importation of capital or goods;
- To acquire technology instead of renting it;
- To eliminate contractual or implicit restrictions for local absorption and dissemination;
- To evaluate the technology to be imported;
- To strengthen the bargaining position of the national licensee;
- To reduce the costs of the technology to be imported;

/1 Quoted by Peter Dirk Siemsen, Licensing of Industrial Property and Transfer of Technology in Brazil, Rio de Janeiro, 1974.

- To support the technological development of the national enterprise;
- To increase exports, particularly of industrial products, avoiding market limitations through trademark licensing;
- To develop knowledge of available technological alternatives;
- To favor non-percentage payments for technical assistance, and when admitted, limiting the percentages;
- To avoid secrecy clauses or prohibition to continue production after termination whereby know-how agreements become patents for unlimited terms; and
- To maintain the present national interest by not discouraging the inflow of foreign investment and the real transfer of technology.

In September 1975, INPI announced its Normative Act No. 15, under which technology agreements are classified into five new categories:

- License agreements for patents;
- License agreements for trademarks;
- Agreements for the supply of industrial technology (intended for production of consumer goods or materials in general);
- Agreements for technical-industrial cooperation (manufacture of capital goods); and
- Specialized technical services agreements.

The contractual duration for licenses was changed from the former maximum of five years to not to exceed the period of validity of the protection granted to industrial property as follows:

- Fifteen years for patent of invention; and
- Ten years for patent of utility model, industrial model or design.

The contractual duration for the supply of industrial technology and technical-industrial cooperation was to be determined by the time necessary to enable the recipient to master the technology, whereas that for specialized technical services was to be the time needed for the rendering of services or the completion of the project.

Another major change under the Act is that the payment of income and withholding taxes will be determined by the two parties concerned in the contractual arrangement. Previously, INPI did not permit the burden of tax payments to be carried by the licensee.

2.3 Control Mechanism for the Entry of Foreign Investment

The control of the inflow of foreign capital is exercised through the registration of investments, reinvestments and remittances at the Central Bank, and through the granting of fiscal incentives by the Industrial Development Council (CDI of the Ministry of Industry and Commerce) to channel investments into priority industrial sectors.

The fundamental law governing foreign capital is Law 4131 of September 1962, as amended by Law 4930 of August 1964. This law is closely related to foreign exchange control in that the foreign exchange needed for remitting profits and technology payments are made available only if the investments and reinvestments have been previously registered at the Central Bank. Registration is required for:

- Foreign capital which enters Brazil in the form of direct investments or loan, whether in money or in physical assets (machinery and equipment);
- Reinvestment of earnings of foreign capital;
- Remittances abroad of dividends, interest, amortization of loan, repatriation of capital and payments of royalties and fees for technical assistance; and
- Alterations in the nominal value of foreign capital according to the inflation index established under monetary correction legislation.

It should be noted that registration requirements are only administrative procedures with no evaluation involved in that the entry of foreign capital does not require government approval.

The inflow of foreign capital can be indirectly influenced by the fiscal incentives offered by CDI to help stimulate and channel investments into industrial sectors considered as high-priority by the government. If a foreign investment project seeks and obtains CDI approval for incentives, it may enjoy a series of benefits:

- Exemption of duties and excise taxes for imported machinery, equipment, parts and components;
- Local financing from government sources and/or government guarantees against international loans;
- Accelerated depreciation of fixed assets acquired in Brazil; and
- Priority study by the Customs Policy Council (CPA - Conselho de Política Aduaneira) for the advisability of tariff protection against competition from imports.

As mentioned before, the fiscal incentives given by CDI can reduce the cost of fixed assets by almost 50% and hence can lead to substantial competitive edges.

2.4 Control Mechanism for the Entry of Foreign Technology

The entry of foreign capital is relatively free from government intervention when compared with the entry of foreign technology. The import of foreign technology embodied in machinery and equipment is directly controlled by the Department of External Commerce (CACEX - Carteira de Comercio Exterior) of the Bank of Brazil, and, if duty and tax exemptions were sought, indirectly influenced by CDI (see above). Under Brazilian Decree Law 37 of November 1966, capital equipment similar to that manufactured locally cannot be imported duty-free. CACEX is the agency that rules on the existence of 'similars' according to the criteria of price, performance and delivery time.

On the other hand, the transfer of technology through technical assistance agreements and licenses for patents and trademarks are regulated by INPI through the registration of the agreements, and by the Central Bank through the authorization of payment remittences. A firm in Brazil that enters into such agreements with a foreign firm must go through the following steps:

- Under the Industrial Property Code of 1971, such technology agreements must be approved and registered with INPI, together with documentation justifying the acquisition of technology from outside the country, advantages for the contractee and the national economy, estimated time for absorption and description of the technology
- When payments abroad are involved, upon registration with INPI, the agreement must also be registered with FIRCE of the Central Bank. Brazilian law requires the prior registration of the source of income, which in this case is the agreement, whenever remittance of income to the exterior is expected.
- At the time when actual remittances are made, these certificates and the invoices showing services rendered are then presented to a commercial bank for the purchase of foreign exchange for the remittance.

It should be noted that it is the recipient firm that has to file the registration, and registration is required whether the technology supplier is domiciled abroad or in Brazil. When technical services are urgently needed and when the payments are less than US$20,000 (US$10,000 before Normative Act No. 15), in lieu of a formal contract the recipient firm can submit an invoice to be approved by INPI.

The registration of technology agreements with INPI is potentially enforced on the recipient firm through three mechanisms:

. Without the registration, the recipient firm will not be able to remit payments to the foreign technology supplier.

. Without the registration, the recipient firm is not permitted to deduct such payments as expenses against its taxable income (except when the payment is from a foreign-controlled subsidiary to its parent, in which case the payment is not tax deductible).

. Patents and trademarks registered in Brazil are subject to forfeiture or compulsory licensing to third parties when not worked for a certain period of time. Registration of patent or trademark licenses is therefore necessary to prove working.

In evaluating the technology agreements, INPI approves a maximum scale of payment based on the tax-deductibility ceilings for technology payments established by the Ministry of Finance under Directive 436 of December 1958, which, incidentally, has not been revised since. In the case of trademark agreements, the payment ceiling allowed is 1% of sales value net of the value-added taxes (IPI, ICM) and the costs of imported components and materials. For patent and technical assistance agreements, the payment ceilings range from 1% to 5% of net sales value (net of taxes and imported input) of the product referred to in the agreement. The payment scales for different sectors are presented in Appendix 2.1

In the case of lump-sum or fixed non-percentage payments, INPI normally requests an estimate for the first five years and accepts a total not higher than which the maximum percentage would generate. No minimum royalties are accepted, but it is possible to include minimum production or sales figures upon which royalties will be based. Fees paid for technicians usually may not exceed US $200 per person per day. Finally, all payments made to the exterior are subject to a withholding tax of 25%.

Prior to the establishment of Normative Act No. 15, INPI would only approve an agreement for a maximum of five years, which may then be renewed for another maximum of five years if justified by the applicant, but usually at a lower rate of payment. These are the same as the duration limits of tax-deductibility of technology expenses accepted by the Ministry of Finance.

When a Brazilian firm is foreign-controlled in that 50% or more of its voting equity is held by the supplier directly or indirectly through a third company, no royalty payments for patents and trademarks are permitted between the two parties. Furthermore, technical assistance payments between the two, while permitted, are not deductible for tax purposes and hence taxed at the profit remittance rate of 30%, plus 5% distributed profit tax if the subsidiary is not an open capital company. However, it is known that some foreign firms bypass the restriction of receiving payments for patents and trademarks from their subsidiaries by capitalizing know-how as investment. Since Law 4131 does not permit registering knowhow as foreign

investment, a technique is used whereby the subsidiary places an order with the parent company which in a parallel transaction registers an equivalent amount as cash investment in the local firm. Neither goods nor money actually change hands, but the foreign firm receives payment for its know-how in the form of profits on its theoretical investment. Apparently such schemes are known and accepted by the Central Bank.

In the case of patents and trademarks, no payments are permitted if they were not granted in Brazil, have expired, been annulled or cancelled, or granted to a foreign entity on an application filed without claiming a foreign priority.

INPI will not approve technology agreements that contain restrictions on the production, marketing or export of the products, or the import of intermediate inputs necessary for their manufacture, or requiring the licensee to use only the trademark of the licensor. Exceptions for export restrictions may be allowed for areas where the licensor has exclusive license agreements for industrial property. Improvements made in the licensed product by the licensee remain its property. INPI will also not accept confidentiality clauses beyond the term of the agreement or price control by the licensor over the sales price of the licensed product. Finally, sublicensing by the licensee is permitted.

Chapter 3. The Technology Agreements, the Survey Sample, and the Questionnaire

3.1 Characteristics of the Technology Agreements Processed by INPI

3.2 The Survey Sample

3.3 The Questionnaire

Chapter 3. The Technology Agreements, the Survey Sample, and the Questionnaire

3.1 Characteristics of the Technology Agreements Processed by INPI

The survey sample for this study was drawn from the population of firms in Brazil that had submitted technology transfer agreements to INPI for registration. Using information from various sources (see appendix 3.1), a data base was compiled for all the technology agreements processed by INPI from 1972 to June 1975 (as of July 1975 INPI discontinued publishing most of the basic information about the agreements). The data base contains information on the ownership and industrial sector of the recipient firm; its relationship with the technology supplier: the type and duration of the agreement; and the terms of payment.

While the remainder of this section will present some highlights of these characteristics, most evaluative comments will be reserved for Chapter five in conjunction with observations from the interview survey of the sample firms.

From 1972 to June 1975, INPI has processed a total of 6185 technology agreements, the dispositions of which are summarized in Table 3.1.

TABLE 3.1 DISPOSITION OF TECHNOLOGY AGREEMENTS

CATEGORY OF ACTION	1972	1973	1974	1975 (To June)	TOTAL
Approved	1117	1267	1483	576	4443
Rejected	—	30	60	44	134
Alterations*	4	—	1	32	37
Cancelled**	—	3	20	3	26
Arquived (expired)	530	136	317	562	1545
TOTAL	1651	1436	1881	1217	6185

*Disposition pending alterations
**Withdrew by firm

If the arquived and cancelled agreements are excluded, i.e., considering only those agreements newly submitted for approval, the actions which INPI took become clearer (see Table 3.2).

TABLE 3.2 ACTION ON NEWLY SUBMITTED AGREEMENTS

ACTION	1972	1973	1974	1975 (To June)	TOTAL
% Approved	99.6	97.7	96.0	88.3	96.3
% Rejected	0.0	2.3	3.9	6.8	2.9
% Altered	0.4	0.0	0.1	4.9	0.8
TOTAL	100.0	100.0	100.0	100.0	100.0

While the overall approval rate is high (96.3%) and the rejection rate is low (2.9%), the figures indicate that INPI has become increasingly more restrictive in its actions over the three-and-a-half year period by rejecting a higher proportion of agreements every year. Although this could be due to an increasingly restrictive application of its regulations, it could also be that INPI is gaining more experience in screening agreements, or that there are more attempted abuses by the submitting firms. It is impossible to judge from this data as INPI does not publish the reasons for rejections or alterations. However, it does confirm the assertion by most business executives interviewed between July and September 1975 (details in Chapter 4 of this report) that it became more difficult to get technology agreements approved by INPI.

For the 4443 agreements approved by INPI, a breakdown by the method of payment and the value of payment approved for those which this is specified is summarized in Table 3.3. The total number of agreements approved increased steadily from 1972 to 1974, by 13.4% in 1973 and 17.0% in 1974 respectively. The data for 1975 include only the first six months. If one assumes a simple doubling of the numbers, then the total number of approved agreements decreased by 22.3% in 1975. The total payment approved also declined in 1975 after a steady increase from 1972 to 1974 if one agreement that year in the government energy sector were excluded as an anomaly. This agreement has an approved payment of U.S.$69.4 million for technology for the Itaipu Binacional hydroelectric power project. At the same time, Table 3.1 shows a tremendous increase in 1975 in the number of agreements pending alterations required by INPI. A possible explanation is that INPI slowed down the granting of approval before

TABLE 3.3

SUMMARY STATISTICS OF TECHNOLOGY AGREEMENTS
APPROVED BY INPI SINCE ITS ESTABLISHMENT

AGREEMENTS	1972	1973	1974	1975**	TOTAL
1. TOTAL NUMBER OF TECHNOLOGY AGREEMENTS APPROVED BY INPI	1117	1267	1483	576	4443
2. TOTAL NUMBER OF AGREEMENTS WITH SPECIAL PAYMENT CONDITIONS*	63	97	115	86	361
3. TOTAL NUMBER OF AGREEMENTS WITH PAYMENT AS PERCENTAGE OF SALES	137	121	140	17	415
4. TOTAL NUMBER OF AGREEMENTS WITH AMOUNT OF AUTHORIZED PAYMENT SPECIFIED	917	1049	1228	473	3667
5. TOTAL VALUE OF PAYMENT APPROVED FOR ITEM 4 (US$,000)	221,151	282,082	375,712	225,968	1,104,913

* Agreements with no amount specified, with zero payment authorized, with payment as fixed or variable rate by day, unit weight, unit horsepower, etc.

** Ending in June 1975

the announcement of Normative Act No. 15) in September 1975. Another possible explanation is that it was part of the government's effort to discourage the short-term outflow of foreign exchange in view of the balance of payments crisis.

While the number of agreements approved increased at rates of 13.4% and 17.0% in 1973 and 1974, the payment approved increased by 27.6% and 33.2%, almost twice as fast. When the payments are normalized by the number of agreements, the average payment per agreement for the four years are, in thousands of U.S. dollars, 241, 269, 306 and 478. Everything else being equal, this would seem to imply a steady rise in the price of technology. However, further analysis reveals that much of the increase in the total payment can be attributed to different sectors in different years (see Table 3.4). These sectors are petroleum and chemicals in 1973; petroleum, chemicals, metallurgy, and paper and pulp in 1974; and energy (government) and transportation materials (automobiles) in 1975. This is an interesting fact, for a closer examination of the data base shows that the recipient firms that accounted for these huge increases in technology payments are mostly state enterprises, local subsidiaries of MNC's, or joint ventures of these two. Distinctively absent from this group are private Brazilian-controlled firms. Another analysis confirms that state-controlled enterprises (including joint ventures with MNC's) and foreign-controlled enterprises (when the transfer is from parent to subsidiary, i.e. the 'foreign related' category) accounted for disproportionate shares of technology payments approved by INPI (see average payment per agreement, last row in Table 3.5). This imbalance is even more dramatic for 'technical assistance' payments made by foreign-controlled firms (see row 1, columns 1 and 2 of Table 3.5), where the average payment per agreement between related parties are almost twenty times that of unrelated, and presumably arms-length, transactions. Several important inferences may be drawn.

First, as a group, Brazilian-controlled private firms hardly seem to be the major culprit in Brazil's substantial payments for foreign technology. If indeed one of the objectives of the control system is to reduce such payments, it is doubtful if these firms would serve as effective targets. Second, state enterprises appear to be the biggest purchasers of foreign technology. Many of them are very powerful monopolies or quasi-monopolies run by the state, and represent some of the largest companies in Brazil. This raises the question as to how much control INPI can really exercise over transactions originating from these companies,

TABLE 3.4

DISTRIBUTION OF APPROVED PAYMENT* BY RECEIVING SECTOR, 1972-JUNE 1975

SECTOR	1972 APPROVED PAYMENTS US$,000	1972 % GROUP	1972 % TOTAL	1973 APPROVED PAYMENTS US$,000	1973 % GROUP	1973 % TOTAL	1974 APPROVED PAYMENTS US$,000	1974 % GROUP	1974 % TOTAL	TO JUNE 1975 APPROVED PAYMENTS US$,000	TO JUNE 1975 % GROUP	TO JUNE 1975 % TOTAL
GROUP A EXTRACTIVE	62,917	100.0	28.5	120,505	100.0	42.8	147,493	100.0	39.2	39,731	100.0	17.6
1. Petroleum	28,228	44.9	12.8	89,317	74.1	31.7	141,754	96.1	37.7	31,390	79.0	13.9
2. Mining	34,689	55.1	15.7	31,188	25.9	11.1	5,739	3.9	1.5	8,341	21.0	3.7
GROUP B TRANSFORMATION	87,398	100.0	39.5	75,854	100.0	26.8	151,964	100.0	40.5	71,738	100.0	31.7
1. Mechanical	2,657	3.0	1.2	1,748	2.3	0.6	3,684	2.4	1.0	898	1.3	0.4
2. Metallurgy	24,564	28.1	11.1	23,462	30.9	8.3	36,517	24.0	9.7	15,267	21.3	6.8
3. Chemicals	18,140	20.8	8.2	39,756	52.4	14.1	83,305	54.8	22.2	28,500	39.7	12.6
4. Transportation Materials	1,727	2.0	0.8	359	0.5	0.1	2,008	1.3	0.5	18,458	25.7	8.2
5. Electric and Communications Equipment	1,283	1.5	0.6	1,185	1.6	0.4	982	0.6	0.3	606	0.8	0.3
6. Food Processing	1,599	1.8	0.7	912	1.2	0.3	1,537	1.0	0.4	136	0.2	0.1
7. Plastics	64	0.1	0.0	15	0.0	0.0	125	0.1	0.0	58	0.1	0.0
8. Textiles	1,486	1.7	0.7	1,053	1.4	0.4	2,750	1.8	0.7	2,011	2.8	0.9

-continued-

* Excludes agreements with no payment, payment amount not specified, payment as percentage of sales or other rates.

Table 3.4 (continued)

SECTOR	1972 APPROVED PAYMENTS US$,000	1972 % GROUP	1972 % TOTAL	1973 APPROVED PAYMENTS US$,000	1973 % GROUP	1973 % TOTAL	1974 APPROVED PAYMENTS US$,000	1974 % GROUP	1974 % TOTAL	TO JUNE 1975 APPROVED PAYMENTS US$,000	TO JUNE 1975 % GROUP	TO JUNE 1975 % TOTAL
GROUP B TRANSFORMATION -continued-												
9. Editorial and Printing	25,092	28.7	11.3	89	0.1	0.0	467	0.3	0.1	14	0.0	0.0
10. Nonmetallic Mineral Products	4,381	5.0	2.0	4,496	5.9	1.6	835	0.5	0.2	1,855	2.6	0.8
11. Paper and Pulp	3,583	4.1	1.6	1,322	1.7	0.5	9,312	6.1	2.5	3,381	4.7	1.5
12. Other Industries	2,822	3.2	1.3	1,457	1.9	0.5	10,442	6.9	2.8	554	0.8	0.2
GROUP C	70,837	100.0	32.0	85,725	100.0	30.4	76,256	100.0	20.3	114,501	100.0	50.7
SERVICES												
1. Construction and Consulting	11,542	16.3	5.2	16,927	19.7	6.0	17,153	22.5	4.6	4,006	3.5	1.8
2. Energy (Private)	37	0.1	0.0	69	0.1	0.0	64	0.1	0.0	43	0.0	0.0
3. Energy (Government)	28,406	40.1	12.8	30,584	35.7	10.8	30,430	39.9	8.1	82,618	72.2	36.6
4. Other Services (Private)	853	1.2	0.4	3,850	4.5	1.4	1,173	1.5	0.3	257	0.2	0.1
5. Other Services (Government)	29,999	42.3	13.6	34,295	40.0	12.2	27,436	36.0	7.3	27,577	24.1	12.2
TOTAL	221,152		100.0	282,084		100.0	375,713		100.0	225,970		100.0

TABLE 3.5

DISTRIBUTION OF APPROVED PAYMENTS BY OWNERSHIP
BY TYPE OF AGREEMENT

TYPE OF AGREEMENT	FOREIGN OWNED		BRAZILIAN		TOTAL
	Related	Unrelated	Private	Government	
TECHNICAL ASSISTANCE					
US$,000	50,716	5,264	61,815	214,874	332,669
Number of Agreements	60	117	278	219	674
US$,000/Agreement	845	45	222	981	494
ENGINEERING SERVICES					
US$,000	21,263	42,601	44,462	260,101	368,427
Number of Agreements	138	491	618	712	1959
US$,000/Agreement	154	87	72	365	188
RESEARCH AND PROJECTS					
US$,000	5,606	3,374	9,018	122,791	140,789
Number of Agreements	50	54	134	160	398
US$,000/Agreement	112	62	67	767	354
CONSULTING					
US$,000	3,936	1,792	8,023	84,800	98,551
Number of Agreements	36	66	162	283	547
US$,000/Agreement	109	27	50	300	180
RENTALS					
US$,000	95	1,076	2,126	149,762	153,059
Number of Agreements	1	4	10	38	53
US$,000/Agreement	95	269	213	3,941	2,888
PATENTS					
US$,000		3,122	1,858	6,241	11,221
Number of Agreements		6	17	11	34
US$,000/Agreement		520	109	567	330
TRADEMARKS					
US$,000				206	206
Number of Agreements				2	2
US$,000/Agreement				103	103
TOTAL					
US$,000	81,616	57,229	127,302	838,775	1,104,922
Number of Agreements	285	738	1219	1425	3667
US$,000/Agreement	286	78	104	589	301

Third, the same question may be raised about the MNC subsidiaries, especially INPI's control over transfer pricing practices in their technical assistance payments. Lastly, the pattern of technology transfer transactions seems to follow broadly the recent trend in Brazil's industrial structure, i.e. the rapid growth of state-controlled and foreign-controlled shares of the industrial economy, especially in petroleum, petrochemicals, chemicals, metal processing and automobiles. Given what was mentioned above, an important question is what role INPI really plays in the overall process of industrial structuring. More will be said about these points in Chapter five.

3.2 The Survey Sample

The sample of firms for the survey was chosen from the data base in three sectors: mechanical equipment, metallurgy and chemicals. The choice of these sectors was based on both objective and subjective criteria as follows:

- The significance of the sector as a technology importer based on the number of agreements and payments approved in the data base;
- The feasibility of providing a sufficiently large number of firms in the Greater Sao Paulo area to safeguard an acceptable number of successful interviews; and
- The overlap with the sectors chosen by other studies in the Center for Policy Alternatives research program in Sao Paulo (of which this study was a part).

After the sectors were chosen, a list of firms in these sectors with headquarters in the Greater Sao Paulo area was developed from the data base of technology agreements. Attempts were made to contact these firms for interviews with senior officials knowledgeable with the technology transfer transactions. Successful interviews (at least two-thirds of the questionnaire completed) were then included in the final sample for analysis. Table 3.6 shows the coverage of the final sample relative to the population in the three sectors.

TABLE 3.6 SAMPLE OF FIRMS FOR THE SURVEY WITH TECHNOLOGY AGREEMENTS APPROVED BY INPI BETWEEN APRIL 1972 AND JUNE 1975

SECTOR	A. NO. OF FIRMS IN BRAZIL	B. NO. OF FIRMS IN GREATER SAO PAULO	C. NO. OF FIRMS IN FINAL SAMPLE	D. C AS % OF B
Mechanical Equipment	130	47	25	53.2
Metallurgy	118	45	11	24.4
Chemicals	127	37	13	35.1
TOTAL	375	129	49	38.0

The ownership of the recipient firm was classified as follows:

- Foreign-controlled—when a foreign entity owns 40% or more of the equity and no single Brazilian entity owns more than 40%.
- Brazilian-controlled—when a Brazilian entity owns 40% or more of the equity and no single foreign entity owns more than 40%.

The distribution of the firms by ownership for the sample and the population of 129 firms based in Greater São Paulo is presented in Table 3.7 for each of the sectors.

TABLE 3.7 OWNERSHIP DISTRIBUTION OF FIRMS IN THE SAMPLE RELATIVE TO THE POPULATION

SECTOR	FOREIGN CONTROLLED	BRAZILIAN CONTROLLED	TOTAL
Mechanical Equipment	14/24*	11/23	25/47
Metallurgy	4/18	7/27	11/45
Chemicals	6/25	7/12	13/37
TOTAL	24/67	25/62	49/129

*Firms in sample/firms in population

Three of the 25 Brazilian-controlled enterprises are government enterprises, one in metallurgy and two in chemicals.

3.3 The Questionnaire

The interviews with the sample of firms were conducted using a structured questionnaire consisting of three main parts. The first part deals with the demographic characteristics and local technical activities of the firm. The second part deals with the manager's perception and experience with INPI and the Central Bank. The last part deals with a specific case of technology transfer with respect to the search, selection and implementation processes. A copy of the questionnaire is attached as appendix 3.2.

The initial questionnaire was pretested for both the ease of administering and coding during four interviews and was slightly revised. Each firm included in the final sample for analysis generally required more than one visit. Most of the executives interviewed were either chief operating officers or division managers. Most interviews were completed with two or more executives from the technical, legal or production area to cross-check some responses. There were twenty-five Brazilian-controlled and twenty-four foreign-controlled firms in the completed sample.

A comment worthy of note is that state-controlled enterprises were generally more reluctant to grant interviews than the others. When they permitted interviews they were generally less forthcoming and informative. Thus the three state-controlled enterprises among the twenty-five Brazilian-controlled firms underrepresent their significance in terms of the aggregate population. This will be brought up again in Chapter five.

Chapter 4. Behavior of the Recipient Firm in Technology Transfer

4.1 Internal R & D and Training Activities of the Recipient Firm

4.2 Receiving Technology Without Payments

4.3 Cases of Technology Transfer

4.4 Search, Evaluation and Decision Process

4.5 Transfer Process

4.6 Experience With the Government Control System

Chapter 4. Behavior of the Recipient Firm in Technology Transfer

The following sections highlight the recipient firm's behavior or perception at various stages of the transfer process and their interactions with the control system, with comparisons between foreign-controlled and Brazilian-controlled firms.

4.1 Internal R&D and Training Activities of the Recipient Firms

4.1.1 Internal R&D Activities

When questioned about their internal resources (equipment and personnel) devoted to in-house research and development activities, the firms responded as follows:

TABLE 4.1 INTERNAL RESEARCH ACTIVITIES

TYPE OF RESEARCH ACTIVITY	FOREIGN	BRAZILIAN	TOTAL
Product or Process Improvement	9	4	13
Testing & quality control only	12	12	24
None	2	6	8
TOTAL RESPONDED	23	22	45

Thirteen firms, or less than 29% of those that responded, reported having some research activities related to product or process improvement. Of these 13, 9 are foreign and 4 Brazilian. Of the 8 that had no technical research activities, 6 are Brazilian. While 34 of the 45 firms reported having testing and quality control activities within the firm, 24 of them had nothing beyond that. It would thus appear that the level of research activities is generally low, especially among the Brazilian firms. Neither does it seem that the lack of in-house research activities was replaced by other local Brazilian sources. The firms reported the use of technical assistance from Brazilian sources as follows:

TABLE 4.2 TECHNICAL ASSISTANCE FROM LOCAL SOURCES

TYPE OF ASSISTANCE	FOREIGN	BRAZILIAN	TOTAL
Product or process research	1	2	3
Equipment or material testing	3	5	8
None	19	15	34
TOTAL RESPONDED	23	22	45

Only 11 out of 45, or 24% of the firms reported having used technical assistance from Brazilian sources. Of these 11 cases of local technical assistance, 6 came from Brazilian research institutes, 3 from local firms and 2 from universities. Eight of the cases were for equipment or material testing and only 3 cases were related to product or process development.

4.1.2 Formal Training Programs

Formal training programs as defined here exclude any incidental on-the-job type of training, and represent a recurring activity of the firm. The types of training were divided into management (including sales training), high-level technical (technical and engineering personnel), and low-level technical (production personnel).

TABLE 4.3 FORMAL TRAINING ACTIVITIES

TYPE OF TRAINING	FOREIGN	BRAZILIAN	TOTAL
All three	4	-	4
High-level tech. & mgmt.	3	1	4
High and low-level tech.	3	3	6
High-level tech. only	4	4	8
Low-level tech. only	1	3	4
Management only	1	-	1
None	7	11	18
TOTAL RESPONDED	23	22	45

Of the 45 firms that responded, 39% (17 firms) had no formal training, 20% (9 firms) had management training, 50% (22 firms) had high-level technical training, and 32% (14 firms) had low-level technical training. It appears also that Brazilian firms are behind foreign subsidiaries in their training activities. Fourteen out of the 22 firms that had some high-level technical training are foreign while 11 out of the 18 that had no formal training programs are Brazilian.

Some of the training activities, especially those of high-level technical in nature, took place outside of Brazil under the firm's parent company or technology supplier.

TABLE 4.4 OVERSEAS TRAINING PROGRAMS

OVERSEAS TRAINING	FOREIGN	BRAZILIAN	TOTAL
Management	6	-	6
High-level technical	12	7	19
Low-level technical	1	-	1

If the combination of internal R&D and training activities were used as an indicator of the firm's internal technical capacity, the following emerges:

TABLE 4.5 INTERNAL TECHNICAL CAPACITY

TRAINING ACTIVITY	PRODUCT/PROCESS RESEARCH	TESTING AND QUALITY CONTROL	NO RESEARCH ACTIVITIES
High-level technical & others	5	7	2
High-level technical only	3	4	1
Others	-	4	1
None	5	9	4

If the firms that have both high-level technical training and some research related to product or process were classified as having good internal technical capacity, only 8 firms would qualify as such (7 foreign, 1 Brazilian), leaving 37 (82% of the 45 firms) as having inadequate or poor capacity.

Even if those with high-level technical training and testing or quality control activities were included as adequate, 19 firms (12 foreign, 7 Brazilian) would qualify, and 26 (58% of 45) firms would be considered as having poor internal technical capacity.

4.2 Receiving Technology without Payments

Nineteen of the 41 firms that responded reported having received foreign technology in the last three years without any payments involved. Thirteen were foreign firms.

TABLE 4.6 FOREIGN TECHNOLOGY WITHOUT PAYMENTS

TECHNOLOGY WITHOUT PAYMENTS	FOREIGN	BRAZILIAN	TOTAL
Received	13	6	19
Did not receive	5	17	22
TOTAL RESPONDED	18	23	41

Among the technologies received were applications and formulae related to raw materials, technologies for plant installation, and servicing of equipment. Eleven of the cases were in the mechanical equipment sector, 7 in the chemical sector and only 1 in the metallurgical sector.

The reason cited by almost all the foreign firms (12 out of 13) for receiving the technology free was that the supplier was the parent company. Five of them also cited legal restrictions and difficulty of obtaining INPI approval for payment. In the case of Brazilian firms, the most common reason for free technology was previous relationship with the supplier, including one case where the supplier has equity participation in the firm. Only 3 firms reported the technology as freely available from the public domain or international associations.

TABLE 4.7 REASONS FOR RECEIVING TECHNOLOGY FREE

REASONS FOR NO PAYMENT	FOREIGN	BRAZILIAN	TOTAL
Technology from parent company	12	0	12
Previous relationship with supplier	0	5	5
Problems with INPI	5	1	6
Public domain or Int'l assoc.	1	2	3

It is interesting to note that, from the data used in Chapter 3, 8 of the 12 firms that reported having received free technology from their parent companies had other contracts with their parent companies where payments are involved. Five of these 8 had contracts with payment as percentage of sales. It is impossible to tell whether technology received free, some cases of which were due to problems of registering with INPI, were in fact paid for implicitly through other contracts, or through other transfer pricing devices. However, this does indicate an area of weakness in the control system.

Another point worthy of note is that the control system may in fact put Brazilian firms at a disadvantage compared with foreign firms. A foreign subsidiary can continue to receive technology from its parent company when the agreement is pending before INPI or even when there is no agreement, in which case the control system is completely bypassed. But it is unlikely a Brazilian firm will get any technology until the agreement and payment have been approved by INPI, except when it can rely on the good-will of a former supplier.

4.3 Cases of Technology Transfer

The firms interviewed were asked to identify a recent significant technological change in their firms that involved obtaining technology from a foreign supplier. Then questions were asked concerning the change, the search and evaluation process in obtaining the technology, the transfer process and the interaction with the government control system.

4.3.1 Type of Technological Change Involved

The type of technology change for the cases are summarized as follows:

TABLE 4.8 THE CASES OF TECHNOLOGY CHANGE

TECHNOLOGY CHANGE INVOLVED	FOREIGN	BRAZILIAN	TOTAL
Product, process and equipment	6	7	13
Product and equipment	7	5	12
Process and equipment	4	3	7
Product and process	1	1	2
Product only	3	3	6
Equipment only	2	2	4
Servicing of equipment	-	1	1
TOTAL RESPONDED	23	22	45

Almost one-third of the cases involved changes in all three elements together, the product, process and equipment. The next most frequently mentioned type of change involved product and equipment. There was one case where no technology change was involved, but the firm contracted an overseas firm to service its equipment. There are no significant differences between foreign and Brazilian firms with respect to the type of change.

As for the product line in which the change was made, 24 cases (53% of 45 cases) were new products which the firm was introducing and 21 cases were existing products. These are also evenly divided between foreign and Brazilian firms.

TABLE 4.9 PRODUCT LINE INVOLVED IN TECHNOLOGY CHANGE

PRODUCT LINE	FOREIGN	BRAZILIAN	TOTAL
New products	12	12	24
Existing product	11	10	21
TOTAL	23	22	45

4.3.2 Equipment Purchase

It is noted that technological changes involving technology transfer from abroad are frequently accompanied by equipment purchases. Thirty-six of the 45 cases (80%) included the purchase of equipment as part of the technology change. Furthermore, 30 of those 36 firms also gave an estimate of the proportion of the equipment that was purchased from abroad. There was only one case where the equipment was 100% Brazilian, and the rest was foreign equipment in various proportions in terms of the value of the total purchase.

TABLE 4.10 PURCHASE OF IMPORTED VERSUS LOCAL EQUIPMENT

PROPORTION OF EQUIP. PURCHASED	FOREIGN	BRAZILIAN	TOTAL
80 - 100% Imported	6	5	11
50 - 79% Imported	7	6	13
1 - 49% Imported	1	4	5
100% Brazilian	-	1	1
% unknown	5	1	6
TOTAL RESPONDED	19	17	36

Of the 30 cases where the estimated proportion was given, 24 (80%) were more than half imported and 11 were more than 80% imported. There is no difference between foreign and Brazilian firms in this respect. However, in the 6 cases where more than half of the equipment was purchased locally, 5 were Brazilian firms.

This points out an area of weakness in the control system for technology transfer in that implicit technology transfer (through machinery and equipment) and explicit technology transfer (through contractual arrangements) are frequently complementary, yet the control for these transfers is dispersed. While the control for explicit transfer is in the hands of INPI, import licenses are granted under CACEX (Board of External Commerce) of the Bank of Brazil. From the government's point of view, the dispersion of authority may dilute the effectiveness of the control. From the firms' point of view, they would have to deal with two bureaucracies that may cause delays and conflicts.

4.3.3 Reasons for the Change

The reasons for undertaking the technology change were given as follows:

TABLE 4.11 REASONS FOR UNDERTAKING TECHNOLOGY CHANGE

REASONS FOR CHANGE (not mutually exclusive)	FOREIGN	BRAZILIAN	TOTAL
New domestic market	16	9	25
Quality improvement of product	7	6	13
Import substitution	6	6	12
Reduction in production cost	6	2	8
Parent company introduced technology	4	-	4
Maintain market position	-	4	4

New domestic market was cited most frequently by both foreign and Brazilian firms as the main reason for the technological change. Although more than half of the firms cited this reason, there were more foreign firms than Brazilian firms in this category. Furthermore, for these 25 cases, 13 (8 foreign, 5 Brazilian) were related to new products being introduced by the firm. The remaining 12 cases (8 foreign, 4 Brazilian) are related to new domestic market for existing products and the technology changes were presumably tied to production expansion. It is interesting to note that none of the firms gave export opportunity as a reason. In fact, for the product in which the change occurred, only 7 firms (5 foreign, 2 Brazilian) exported more than 5% of what they produced, and among these, only 1 firm exported more than 10%. Three of these firms were in the chemical sector and 4 in the mechanical sector. Almost all of the exports were made to other Latin American countries.

The next most frequently cited reasons for the change were quality improvement of the product and import substitution. These are about equally divided between foreign and Brazilian firms. The importance given to import substitution also raises the point that, given Brazil's internal supply of technology, replacing the import of a product with local manufacture would

often create a demand for imported technology, at least in the short term. In the intermediate term, foreign technology may still be needed for incremental improvements of the product or the manufacturing process. Although quality improvement of the product is the second most frequently cited reason resulting in the purchase of foreign technology, it is not known how many of these cases refer to products that were recently import-substituted.

Surprisingly perhaps, reduction in production cost only ranks fourth among the reasons for changes involving technology transfer. Eight firms (18% of 44 firms that responded) gave this reason for the change and 6 of these are foreign firms. It would thus appear that technology transfer is more frequently related to sales-oriented market conditions than production conditions.

The last two categories of reasons are more passive and reactive in character and they are divided among foreign and Brazilian firms with no overlaps. Four foreign subsidiaries stated that their parent companies decided to introduce the technology in Brazil after it was introduced elsewhere within the multinational family. Four Brazilian firms stated that the new technology was needed to maintain their market positions.

4.3.4 Product Line For Which Technology Was Imported

As noted in 4.3.1, 24 cases of the technology changes were for products newly manufactured by the firms and 21 cases were for already existing products. These are about evenly divided between foreign and Brazilian firms. Although the changes started in different years, more than 80% of the cases occurred during the period 1972 to 1975. Thirty-three firms gave the domestic market share in 1974 for the product in question as follows:

TABLE 4.12 DOMESTIC MARKET SHARES

DOMESTIC MARKET SHARE IN 1974	FOREIGN	BRAZILIAN	TOTAL
75% or more	1	3	4
50% - 74%	4	5	9
25% - 49%	5	3	8
24% or less	2	-	2
Production just began or not yet	3	7	10
TOTAL RESPONDED	15	18	33

Among the 23 cases where production had started and the market shares known, 13 or more than half of these cases involved market shares of 50% or more. Also, in 14 of these cases (7 foreign firms, 7 Brazilian firms) the product was also exported. However, the export market was generally unimportant as only 7 firms (5 foreign, 2 Brazilian) exported more than 5% of what they produced in 1974 and only 1 firm exported more than 10%.

When asked who the firms considered as their major competitors in the domestic market for the product line, the responses were as follows (24 foreign firms, 21 Brazilian firms):

TABLE 4.13 MAJOR COMPETITORS IN DOMESTIC MARKET

MAJOR COMPETITORS IN DOMESTIC MARKET (not mutually exclusive)	FOREIGN	BRAZILIAN	TOTAL
Subsidiaries of foreign firms	19	13	32
Brazilian firms with foreign technology	8	11	19
Brazilian firms with local technology	6	3	9
Firms abroad exporting to Brazil	7	5	12
No major competition	1	3	4

Foreign subsidiaries were by far the most important source of competition and were identified by 79% of the foreign firms and 62% of the Brazilian firms. Brazilian firms with foreign technology were next in importance with 33% of the foreign firms and 52% of the Brazilian firms reporting so. Then the next important source of competition was from firms located abroad but exporting to Brazil. It is apparent that the firms considered themselves competing primarily with other firms manufacturing with foreign technology.

Another characteristic of the product line applies only in the case of the 24 foreign firms in the sample. Among 21 responses, 18 firms characterized the product as essentially the same as that produced by the parent company and only 3 firms indicated that there were significant modifications made to the product manufactured in Brazil.

4.4 Search, Evaluation and Decision Process

4.4.1 Alternative Suppliers Considered

Alternative suppliers considered were defined to be suppliers other than the one finally chosen and which the receiving firm had initiated written or personal contact with and sought information from.

TABLE 4.14 NUMBER OF ALTERNATIVE SUPPLIERS CONSIDERED

NO. OF ALTERNATIVE SUPPLIERS	FOREIGN	BRAZILIAN	TOTAL
None	14	7	21
1 - 2	5	9	14
3 - 5	4	5	9
More than 5	-	2	2
TOTAL RESPONDED	23	23	46

The search activity for both foreign and Brazilian firms appear to be very limited. Thirty-five out of 46 firms (76%) considered two alternative suppliers or less for the technology they obtained. Twenty-one firms (46% of 46) did not consider any alternative suppliers at all, and there are twice as many foreign firms in this category as there are Brazilian ones. The reason for this became clearer when the firms' relationship wtih the supplier was determined. Among the 14 foreign firms that did not consider any alternatives, 12 were related to the supplier either directly or indirectly. In 10 cases the supplier was the parent company and in the other 2 cases the technology came from another subsidiary of the same multinational family. In 2 of the 7 Brazilian cases where no alternatives were considered, the suppliers were also minority shareholders in the receiving firms.

Twenty-five firms (9 foreign, 16 Brazilian) had considered alternative sources for the technology they needed. However, none of these alternatives included local sources, neither Brazilian research institutes nor other Brazilian firms. The alternative suppliers considered were distributed geographically as follows:

TABLE 4.15 GEOGRAPHIC DISTRIBUTION OF ALTERNATIVE SUPPLIERS CONSIDERED

COUNTRY OR REGION	NUMBER OF ALTERNATIVE SUPPLIERS
United States	14
Western Europe	48
Japan	2
Others	7
TOTAL	71

The fact that no local alternatives had been considered is a significant one. Technological dependence on foreign sources is a common issue among developing countries. But the phenomenon appears to be one of a vicious circle where the causal relationship is not clear. The dependence on foreign technology is perhaps both a result and a cause of lack of local sources of supply. In the case of Brazil, there are many research institutions, primarily government funded, operating in most major sectors. However, it appears that they are seldom used as a source of commercial industrial technology. This finding is also reported in another project[1] of this research program jointly conducted by M.I.T.'s Center for Policy Alternatives and the Fundação Carlos Alberto Vanzolini of the University of São Paulo.

4.4.2 Important Sources of Information Used in Selection

Forty-two firms (21 foreign, 21 Brazilian) gave the following responses concerning the important sources of information used in the selection process:

TABLE 4.16 MAJOR SOURCES OF INFORMATION USED FOR SELECTION

IMPORTANT INFORMATION SOURCES (not mutually exclusive)	FOREIGN	BRAZILIAN	TOTAL
The supplier	15	15	30
Other firms in the industry	5	8	13
Field trips overseas	6	5	11

-continued-

[1] Characteristics of Technological Change in the São Paulo Firm, André Ghirardi, Moysés Pluciennik, and James M. Utterback, June 1976.

TABLE 4.16 (continued)

IMPORTANT INFORMATION SOURCES (not mutually exclusive)	FOREIGN	BRAZILIAN	TOTAL
Publications	5	6	11
Foreign consultants	1	2	3
Brazilian consultants	-	1	1
Trade fairs in Brazil	-	1	1
Major customer	-	1	1

Thirty firms cited the supplier itself as the important source of information. This is the most frequently cited source for both foreign and Brazilian firms. However, 11 of the 15 foreign firms in this category received their technology from a related supplier, and 10 of them cited the supplier as their only important source of information. Among the 15 Brazilian firms that gave the supplier as an important source of information, 5 firms cited this as the only source and 4 firms had considered no other alternatives.

The second most frequently cited important source of information differs between foreign and Brazilian firms, although the difference is small. For foreign firms it is information gathered from field trips overseas, and for Brazilian firms it is information from other firms in the industry. At the same time, about one-fourth of all the firms cited publications as an important source of information. These include journals, trade magazines and other forms of literature.

Worthy of note is that few firms reported the use of outside independent consultants as an important source of information in evaluating potential suppliers. Furthermore, none of the firms considered research institutes or government entities as important sources.

4.4.3 Feasibility Study

The firms interviewed were asked to describe how they evaluated the technology to be imported before the decision was made. Then the feasibility studies made were categorized into technical and financial types. The first type is concerned with the technical or engineering aspects of the technology itself. The second type includes studies that are financial in nature, such as sales or profit forecasts, and market studies.

TABLE 4.17 FEASIBILITY STUDIES

FEASIBILITY STUDIES MADE	FOREIGN	BRAZILIAN	TOTAL
Yes	20	13	33
No	3	9	12
TOTAL RESPONDED	23	22	45

TABLE 4.18 TYPE OF FEASIBILITY STUDY MADE

STUDY MADE	TECH. STUDY		FIN. STUDY		BOTH		TOTAL***	
	F*	B**	F	B	F	B	F	B
Internally	1	3	5	5	4	5	10	13
By parent company	1	-	1	-	6	-	8	-
By the supplier	-	-	-	-	1	-	1	-
By customer	1	1	1	-	-	-	2	1

* F = foreign firms

** B = Brazilian firms

*** Total is higher than 'yes' category in previous table because 1 foreign firm had both studies made internally and by parent company, and 1 Brazilian firm made a financial study internally and its customer made the technical study.

Several observations may be made from these tables. The first is that there is a lack of pre-transfer evaluation activities on the part of Brazilian firms. Nine out of 22 Brazilian firms (41%) did not make any feasibility studies prior to choosing the supplier. The reasons cited by these firms for not making the studies are as follows:

TABLE 4.19 REASONS FOR NOT MAKING STUDIES

REASONS FOR NOT MAKING STUDY (not mutually exclusive)	FOREIGN	BRAZILIAN	TOTAL
Used common sense or business judgment	-	7	7
Studies are expensive due to lack of internal capacity	-	3	3

-continued-

TABLE 4.19 (continued)

REASONS FOR NOT MAKING STUDY (not mutually exclusive)	FOREIGN	BRAZILIAN	TOTAL
Supplier is well-known	-	2	2
Technology from parent company	3	-	3

Seven of the nine Brazilian firms claimed that they relied on common sense or business judgment in selecting their technology suppliers. Five of these firms may be considered small relative to the population of the technology importers in their sectors. Other firms cited that they did not have the capacity to make the feasibility studies internally and to have them done outside the firm would be expensive. Two firms also claimed that their suppliers were well-known and it was unnecessary to make any study.

As for the 13 Brazilian firms that had made feasibility studies, there seems to be a general lack of technical evaluation done. Only 8 of these firms had made technical evaluations. Coupled with the fact that the majority of firms relied on the suppliers themselves as the important source of information (see Section 4.4.2), this would indicate an area of weakness in the evaluation and negotiation phase of technology transfer in the case of Brazilian firms.

In the case of foreign subsidiaries, there are proportionately more firms that had made feasibility studies. But 8 out of the 20 firms (40%) relied on studies made by the parent companies, 7 of which were also the technology suppliers. There also seems to be a lack of technical evaluation even when dealing with an unrelated supplier. Among 10 cases of foreign firms getting technology from unrelated suppliers, only 6 firms made technical studies concerning the technology. This lack of emphasis on technical evaluation appears to be a general feature of technology transfer behavior among both foreign and Brazilian firms. This coincides with that the most frequently-cited reasons for technology change (see Section 4.3.3) are market or sales oriented rather than production oriented.

4.4.4 Principal Reasons For Choice of Supplier

Forty-four firms (22 foreign, 22 Brazilian) gave the principal reasons for selecting the technology supplier as follows:

TABLE 4.20 PRINCIPAL REASONS FOR CHOICE OF SUPPLIER

PRINCIPAL REASONS FOR CHOICE (not mutually exclusive)	FOREIGN	BRAZILIAN	TOTAL
Prestige or reputation of supplier	6	15	21
Parent company or equity partner	13	4	17
Price of technology	5	5	10
Quality of technology	3	6	9
Previous relationship with supplier	1	2	3
Approval of major customer	1	1	2
Only supplier available	2	-	2
Supplier's domestic distribution channel	1	-	1

In the case of Brazilian firms, 15 out of 22 firms (68%) cited the prestige or reputation of the supplier as the main reason for their choice. Six of these firms gave this as the only reason. Although this reason appears to be rather subjective or judgmental, it may be of more practical value to a small or medium size firm, where the prestige of its licensor or supplier can help market its products. As a matter of fact, among the 21 firms that cited this reason, only 3 are large firms relative to technology importers in their sectors.

As for foreign firms, 13 out of 22 firms (59%) cited the reason for their choice was that the supplier was their parent or sister company. Ten of them gave this as the only reason. In comparison, the price and quality of the technology are mentioned by only a few firms. It appears that the source of direct investment has a very strong influence over the choice of technology.

Once again, the technical aspects of the technology itself was not emphasized by many firms, whether foreign or Brazilian. Only 9 firms (20% of 44 firms) cited the quality of technology as an important reason for their choice.

Almost all of the other reasons given were non-technical in nature.

4.4.5 Level of Final Decision

Table 4.21 Level of Final Decision

DECISION MADE BY	FOREIGN	BRAZILIAN	TOTAL
Parent company	15	-	15
Board of directors of firm	7	22	29
TOTAL RESPONDED	22	22	44

In the case of Brazilian firms, the final decision on the selection was made by the board of directors with no exceptions. This indicates that the choice of technology suppliers is a very high-level decision.

In the case of foreign firms, 15 out of 22 firms (68%) had their decisions made outside of Brazil at their parent headquarters. If one traces through the entire process of search, evaluation and selection among foreign subsidiaries, the conclusion would be that there is a very low level of independence in technological decisions. Brazil has a very large stock of direct foreign investments (about US $ 6 billion at year end of 1974, according to the Central Bank) which accounts for a significant portion of the economy. Visao's 1974 directory of 1000 largest Brazilian firms estimated that foreign controlled firms accounted for 22.1% of the assets and 36.6% of the sales.[1] In some sectors, the foreign share of assets were as high as 49.6% and the share of sales as high as 61.8%. If the results of this study were generalized to all foreign-controlled firms, a very sizeable portion of the Brazilian economy would have very little technological autonomy. This would indicate an area of conflict if official policy goals were to pursue more technological autonomy and more direct foreign investments at the same time.

4.4.6 Determination of Appropriate Payment

When asked to identify the key factors in determining the appropriate payment for the imported technology, 36 firms (19 foreign, 17 Brazilian) gave

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[1] Robinson, Richard D., National Efforts to Establish Guidelines For the Behavior of Multinational Corporations, M.I.T., Cambridge, 1975.

the following responses:

TABLE 4.22 KEY FACTORS IN DETERMINING PAYMENTS

KEY FACTORS IN DETERMINING PAYMENTS	FOREIGN	BRAZILIAN	TOTAL
Parent company decided	9	-	9
Business judgment and experience	1	5	6
Limits of Brazilian law	4	4	8
Price of competing suppliers	4	3	7
Supplier determined	1	3	4
Forecast of change in sales	1	3	4
Forecast of change in production cost	1	1	2

When ranked by the absolute frequency of responses, foreign subsidiaries cited parent company decision (in all 9 cases the supplier was the parent company or sister company), limits of Brazilian law (in 3 of 4 cases the supplier was the parent or sister company), and price of competing suppliers as the key factors in determing payments.

The key factors cited by Brazilian firms are more dispersed, and in more than half of the cases they were indicative of a weak evaluative and bargaining capacity. First of all, the most frequently cited factor was business judgment and experience, which is vague and ad hoc. Then in 7 of the remaining cases, the key factors used in determing payments were externally imposed (limits of Brazilian law and supplier determined), versus only 3 cases where the key factor was the price of competing suppliers. Coupled with the fact that almost a third of the Brazilian firms had not considered any alternative suppliers (Section 4.4.1), the reliance on the supplier as the important source of information (Section 4.4.2), the lack of feasibility studies made (Section 4.4.3), this does indicate an area of weakness among Brazilian firms in the process of purchasing foreign technology.

4.4.7 Characteristics of the Supplier Chosen

TABLE 4.23 PRINCIPAL ACTIVITY OF THE SUPPLIER

PRINCIPAL ACTIVITY OF SUPPLIER	FOREIGN	BRAZILIAN	TOTAL
Manufacture of same/similar product	20	18	38
Manufacture of different product	3	2	5
Consulting	-	3	3
Research and development	1	-	1
TOTAL RESPONDED	24	23	47

In 38 of the 47 cases (81%) the firms purchased technology from foreign firms that were engaged in the manufacture of the same or similar products. Among the 5 cases where the foreign supplier manufactured a different product were 4 cases where the supplier manufactured equipment that was part of the technology transfer. There were only 4 cases where the supplier was not engaged in manufacturing, but was in the consulting or research and development business.

TABLE 4.24 RELATIONSHIP WITH THE SUPPLIER CHOSEN

RELATIONSHIP WITH THE SUPPLIER	FOREIGN	BRAZILIAN	TOTAL
Parent company	10	-	10
Subsidiary of parent company	3	-	3
Minority shareholder	1	2	3
Unrelated	10	21	31
TOTAL RESPONDED	24	23	47

Among the foreign firms, only 10 out of 24 (42%) were unrelated to the technology supplier. In the Brazilian case, 2 firms purchased technology from their foreign partners that had minority shares in their equity. In 5 of the 21 cases where the Brazilian firms were unrelated to the suppliers, the foreign suppliers became minority shareholders by accepting equity as partial payment

for the technology transferred, and were unrelated to the Brazilian firms before the transactions.

TABLE 4.25 SUPPLIER ALSO CUSTOMER OF THE FIRM

SUPPLIER ALSO A CUSTOMER	FOREIGN	BRAZILIAN	TOTAL
Yes	6	4	10
No	17	18	35
TOTAL RESPONDED	23	22	45

In 10 of the 45 cases that responded, the firms also exported their products to the technology supplier. Four of the 6 foreign firms that exported to the supplier were also subsidiaries of the supplier. In 2 of the 4 Brazilian firms that exported to the supplier, the supplier was also the minority partner in the firm.

The country of origin of the supplier is distributed as follows:

TABLE 4.26 GEOGRAPHIC DISTRIBUTION OF SUPPLIER CHOSEN

COUNTRY OF ORIGIN OF SUPPLIER	FOREIGN	BRAZILIAN	TOTAL
United States	7	14	21
West Germany	7	3	10
France	2	2	4
Switzerland	2	2	4
Italy	1	2	3
United Kingdom	3	-	3
Japan	1	-	1
Canada	1	-	1
TOTAL RESPONDED	24	23	47

4.5 Transfer Process

4.5.1 Nature of the Technology Imported

TABLE 4.27 TYPE OF TECHNOLOGY IMPORTED

TYPE OF TECHNOLOGY	FOREIGN	BRAZILIAN	TOTAL
Patent, trademark & tech. services	4	7	11
Patent and tech. services	4	2	6
Trademark and tech. services	2	3	5
Technical services only	11	10	21
Machinery only	2	1	3
TOTAL RESPONDED	23	23	46

The 46 cases of technology transfer included 22 cases which were related to the licensing of patents or trademarks, 21 cases of non-proprietary technical information and services only, and 3 cases of machinery only. Except for the 3 cases of machinery purchase and 2 cases of technical services received by foreign subsidiaries from their parent companies, all the other 41 cases involved a formal technology agreement submitted to INPI for approval. The 10 agreements by foreign firms involving the use of industrial property (i.e. patents and trademarks) are particularly interesting, as Brazilian law prohibits royalty payments for industrial property between subsidiaries and their foreign parents. Five of these 10 agreements would fall under this provision, but only 1 involved no payment. This agreement specified patent and trademark only, whereas all the other 4 included 'technical assistance' and were paid on the basis of percentage of sales. This may suggest that foreign subsidiaries are using technical assistance as a possible loophole in the control system to remit payments to their parents.

4.5.2 Implicit Conditions Under the Agreement

One of INPI's primary functions in screening technology agreements is to curtail restrictive conditions that limit the activities of the receiver or hinder the dissemination or continued use of the technology after the agreement

expires. These restrictive conditions include tied-sourcing of intermediate inputs, export restrictions, licensor's proprietory rights to improvements on the patents, confidentiality clauses beyond period of validity of agreement, and conditions restricting the production or marketing of the product. It was obviously difficult for the firms interviewed to admit to any of these conditions and hence some of the following tabulations were undoubtedly underestimated. Even so, many of the firms interviewed, especially among the Brazilian ones, indicated implicit 'gentlemen's agreements' between them and the suppliers as necessary conditions in getting the technology. The following tabulation excludes 4 firms (2 Brazilian, 2 foreign) that did not respond, and the 13 cases of foreign firms where the supplier is the parent or sister company, as unambiguous management control by the parent companies could clearly impose any conditions they wanted.

TABLE 4.28 CONDITIONS FOR TECHNOLOGY TRANSFER

CONDITIONS FOR TRANSFER (not mutually exclusive)	FOREIGN	BRAZILIAN	TOTAL
Exclusive use of technology in Brazil	7	14	21
Confidentiality beyond period of formal agreement	3	8	11
Export restrictions	2	5	7
Supplier entitled to improvements on technology	4	13	17
Minimum payments necessary	3	4	7
Purchase of intermediate inputs from supplier	2	6	8
Obligatory renewal of contract	-	2	2
Agreement of sales to supplier	-	1	1
TOTAL NO. OF FIRMS	10*	23	33

* Only firms not controlled by suppliers are included.

It is noted that 7 out of 10 foreign firms (70%) and 14 out of 23 Brazilian firms (61%) had exclusive use of the technology in Brazil. In the rest of the cases, the supplier could presumably sell the technology to another firm.

In 11 cases (8 Brazilian, 3 foreign), the firms reported they had agreed to maintain confidentiality of the technology even after the termination of the agreement as approved by INPI, in most cases indefinitely. It is noted that 7 (5 Brazilian, 2 foreign) of these 11 cases involved industrial secrets not protected by patents.

Seven firms reported that they had agreed not to export to certain countries the product for which the technology was used. Four of these cases (all Brazilian) involved unpatented technology. For the other 3 cases involving patents, it is not known whether the supplier had working licenses in those countries. One Brazilian firm admitted that the export restriction was rejected by the government authorities but was included implicitly. Although not included in the above tabulations, 2 foreign subsidiaries explained that formal restrictions were not necessary since the parent companies made all the export decisions. Even though not admitted explicitly, this obviously could be extended to all foreign subisidiaries and all intra-company decisions over which the parent company exercises control. Witness the influence of the parent company over the selection and pricing of technology to a subsidiary as described in previous sections.

Other conditions between the two parties frequently cited include grant-back provisions of improvement on the technology, purchase of parts and components from the supplier and payment of minimum royalties. Fewer mentions were made about obligatory renewal of the contract and sales agreement with the supplier.

4.5.3 Method of Transfer

The methods used for transferring the technology fall under three broad categories, hardware(including machinery, instruments, dies, molds and matrices), documentation (including drawings, designs, specifications, technical data, formulae, blueprints and operating manuals), and people (including presentation of services and instructions). Almost all of the transfers included the last two categories:

TABLE 4.29 METHOD FOR TRANSFERRING THE TECHNOLOGY

MODE OF TRANSFER	FOREIGN	BRAZILIAN	TOTAL
Documentation	22	19	41
Training of Brazilian technicians overseas	14	18	32
Short-term visits of foreign technicians	16	13	29
Long-term residence of foreign technicians in Brazil	6	3	9
Equipment and instruments	9	3	12
Dies, molds and matrices	3	3	6
TOTAL RESPONDED	24	23	47

Twenty-one of the 47 cases (45%) involved both training of Brazilians overseas and short-term visits of foreign technicians. Seven of these cases also included long-term residence (more than 6 months) of foreign technicians.

4.5.4 Time Taken for Absorption

The time taken for absorption of the technology was defined to be the time between when the technology change was introduced and when it became fully operational and integrated into the production process. Forty-one firms (19 foreign, 22 Brazilian) responded as follows:

TABLE 4.30 TIME FOR ABSORBING THE TECHNOLOGY

TIME FOR ABSORPTION	FOREIGN	BRAZILIAN	TOTAL
1 year or less	14	9	23
1 - 2 years	4	5	9
More than 2 years	1	5	6
Being implemented	-	3	3
TOTAL RESPONDED	19	22	41

It is noted that, proportionately, foreign firms generally took less time than Brazilian firms for absorbing the technology introduced. In linking the time needed for absorption to the estimated internal technical capacity of the firms as described in Section 4.1.2, it was found that the firms that were considered as having adequate capacity took less time for absorption. Using the less conservative classification, 19 firms were considered as having adequate internal technical capacity. Among these firms, 3 did not give an estimate for the absorption time and in 1 case the technology was being implemented. But in the remaining 15 cases, 11 took one year or less to absorb the technology, 2 took between 1 to 2 years, and 2 took more than 2 years.

It is also interesting to note that the time needed for absorption bore no relationship to the duration of the technology agreement. The intersection of the two is as follows:

TABLE 4.31 RELATIONSHIP BETWEEN ABSORPTION TIME AND DURATION OF AGREEMENT

TIME FOR ABSORPTION	DURATION OF AGREEMENT			TOTAL
	1 YR.	3 YRS.	5 YRS.	
1 year or less	5	1	13	19
1 - 2 years		1	8	9
More than 2 years		2	4	6
Being implemented			3	3
Not available			4	4
TOTAL	5	4	32	41

As can be seen, the duration of the agreement is usually much longer than the time needed for implementing the technology. In fact, 78% of the agreements were for 5 years, the maximum allowable under INPI regulations, although an agreement may be renewed for another 5 years if approved. This can be explained by that while the time for absorption is related to the transfer of technology the duration of the agreement is related to payments for the technology. All the one-year agreements were paid in fixed sums, and all the 3-year and 5-year agreements were paid based on percentage of sales except for four agreements which involved periodic fixed payments and one agreement with no payment involved.

4.5.5 Transfer Problems and Continued Assistance Required

Fourteen foreign firms received their technologies from related companies and 7 Brazilian firms from their minority joint-venture partners. All of these firms perceived the performance of the technology imported as satisfactory or better than expected. The same is true for the remaining 26 firms (10 foreign, 16 Brazilian) except for 1 foreign firm that rated the performance as unsatisfactory. However, many firms encountered problems during and after the technology transfer. The problems encountered by the firms may be separated into those relating to government regulations and those that did not.

For the 41 cases (19 foreign, 22 Brazilian) that involved agreements submitted to INPI for approval, 34 firms (14 foreign, 20 Brazilian) also gave the time taken for approval. Eighteen of these 34 cases (53%) took more than 6 months to obtain the approval. Furthermore, 30 firms (10 foreign, 20 Brazilian) indicated whether the agreement required alterations imposed by INPI before the approval was given. Eighteen agreements were approved as they were submitted and in 12 cases (5 foreign, 7 Brazilian) alterations were required. Eight of these 12 agreements were among those that took more than 6 months for approval. Some delays may be expected when alterations were required, but 7 such agreements took more than a year for approval and 5 of these originated from Brazilian firms. There were also 8 agreements with no alterations that took more than six months to approve. Although it is not known how much of the delay was due to INPI or the firms themselves, many of the firms claimed that delays were costly to them, and that INPI was understaffed. It was found that INPI had a staff that varied between 10 to 15 people at times that were responsible for screening about 1500 agreements or invoices per year, which tends to substantiate the claims made by the firms.

Four firms, all Brazilian, encountered difficulties in obtaining import licenses for parts and components involved in the technology transfer, and 8 firms (6 foreign, 2 Brazilian) also had problems for imported equipment. These will be treated in more detail in the next section.

Problems not related to government regulations were as follows:

TABLE 4.32 PROBLEMS ENCOUNTERED DURING OR AFTER TRANSFER

PROBLEM ENCOUNTERED	FOREIGN	BRAZILIAN	TOTAL
Lack of technical personnel	4	1	5
Local supply of parts and components	1	4	5
Operation of the technology	4	3	7
Problem with technology supplier	2	1	3
Other problems	2	1	3
No major problems	11	14	25
TOTAL NO. OF FIRMS	21	22	43

Twenty-eight firms (16 foreign, 12 Brazilian) (60%) also claimed that continued technical assistance from the supplier was necessary even after the implementation of the technology. The assistance required is categorized into two types. The first type is technical services required occasionally for operating the technology that was transferred, such as quality control or inspection, machine maintenance, and trouble-shooting for specific technical problems. The second type is more informational in nature and related to new ideas, changes or improvements on the technology and updates on current and competing technologies.

TABLE 4.33 CONTINUED EXTERNAL ASSISTANCE REQUIRED

CONTINUED EXTERNAL ASSISTANCE	FOREIGN	BRAZILIAN	TOTAL
Servicing or operating the technology	7	2	9
New ideas, changes or improvements	4	7	11
Both	5	3	8
Not required	8	11	19
TOTAL RESPONDED	24	23	47

It is interesting to note that 10 out of the 16 foreign firms that required continued technical assistance from the suppliers had a steady and

secure source of technology in that the suppliers were their parent companies. This locked-in and yet readily available source may also explain why there are more foreign than Brazilian firms (12 to 5) that rely on their suppliers for the servicing type of contined assistance.

4.5.6 Perceived Effects on Other Firms

Thirty-five firms (17 foreign, 18 Brazilian) reported that the technology transfer had important effects on other firms in Brazil. These were categorized into effects on local suppliers or subcontractors of the firms, their customers and their competitors.

TABLE 4.34 POST TRANSFER EFFECTS ON OTHER FIRMS IN BRAZIL

EFFECTS ON LOCAL FIRMS	FOREIGN	BRAZILIAN	TOTAL
1. Subcontractors:			
New business generated	12	6	18
Production of higher quality inputs	4	3	7
New training or technology acquired	2	1	3
2. Customers:			
Import substitution	4	6	10
Better quality product	4	4	8
Higher productivity in customers' production	2	2	4
Lower cost product	2	-	2
Training of customers' technicians	1	-	1
3. Competitors:			
Stimulated search for similar technology	5	3	8
Lost market share	1	5	6
New competitors entered market	1	2	3
Stimulated change in technology	3	-	3
Availability of trained personnel	1	-	1

Eighteen firms claimed that the technology they acquired had resulted in the generation of new business for their local subcontractors. Thus in about half of the cases (18 out of 35) there was an increase in the demand for local parts and materials after the technology transfer. Seven firms also reported that their subcontractors improved the quality of what they produced due to new requirements.

As for the firms' customers, the most frequently cited effect is import substitution. Ten firms claimed that their products substituted for what their customers were importing previously. Eight firms reported that the technology had resulted in better quality products for their customers and 4 firms also claimed that higher quality inputs induced higher productivity in their customers' production. However, only 2 firms reported lowering the cost of their products to the customer as a result of the technology transfer. But it should also be noted that reduction in production cost was considered by only a few firms as a major reason for undertaking the technology change (see Section 4.3.3).

It appears that one of the important effects of technology transfer is the stimulation of demand for similar technology. Eleven firms (31% of 35 firms) reported that their competitors either adopted similar technology changes or started searching for similar technology after they introduced the technology changes in their firms. It is interesting to note that 8 foreign firms reported this effect on their competitors while only 3 Brazilian firms did so. At the same time, 5 out of the 6 firms that claimed their competitors had lost some of their market shares were Brazilian. Referring back to Section 4.3.3 concerning the major reasons for undertaking the technology change, almost twice as many foreign firms cited new domestic market as the reason compared to Brazilian firms while all the firms that cited the need to maintain their market positions were Brazilian firms. This would lead one to hypothesize that more foreign firms introduce imported technology as an aggressive market action and a pioneering one with respect to the Brazilian market, while more Brazilian firms do so out of defensive reaction. But a longitudinal study of a given product line, rather than a cross-sectional study like the present one, would be necessary to verify this rigorously.

Finally, it is worthy of note that the direct spin-off of training outside of the receiving firm tend to be limited. It is impossible to tell how

much indirect training activities had resulted from the technology transfer and the longer-term mobility of trained technicians, but only 5 firms (4 foreign and 1 Brazilian) reported the provision of training to third parties. Three firms provided for their local suppliers as a result of the technology transfer, one firm trained the customer and one firm lost some of its trained personnel to its competitor.

4.6 Experience with the Government Control System

One part of this study focussed on the experience of the firms in dealing with the government control system in importing technology. These primarily involved dealing with INPI in registering the technology agreement, obtaining permission from the Central Bank to remit payments in foreign exchange, and obtaining licenses and fiscal incentives from CACEX for importing machinery and intermediate inputs.

4.6.1 Disposition of Agreements Submitted to INPI

Among the 41 cases (19 foreign, 22 Brazilian) that involved the submission of a formal technology agreement to INPI for approval, 34 firms (14 foreign, 20 Brazilian) indicated the time lapse between when the agreement was first submitted to when the approval was given.

TABLE 4.35 TIME TAKEN FOR APPROVAL OF AGREEMENT BY INPI

TIME TAKEN FOR APPROVAL	FOREIGN	BRAZILIAN	TOTAL
Less than 3 months	3	3	6
3 - 6 months	4	6	10
6 months - 1 year	3	4	7
More than 1 year	4	7	11
TOTAL RESPONDED	14	20	34

As noted before in Section 4.5.4, a substantial proportion of the agreements took a long time to be approved. About half of the agreements took less than 6 months to approve and about half took more, with 11 agreements (32% of 34) taking more than a year.

However, it should be pointed out that 8 of the 18 agreements that took longer than 6 months for approval had alterations in the agreements required by INPI, which accounted for part of the delay. But, as also mentioned before, it was found that INPI had only 10 to 15 staff members evaluating about 1500 agreements and invoices per year. Considering the complexity of their tasks, it is perhaps not surprising that delays frequently occurred. Furthermore, some of the business executives interviewed suggested there were also political reasons for the more recent delays as part of the government's efforts to discourage the short-term outflow of foreign exchange in the face of a balance-of-payment crisis.

Thirty firms (10 foreign, 20 Brazilian) indicated whether the agreements were approved by INPI with alterations required.

TABLE 4.36 ALTERATIONS REQUIRED BY INPI

ALTERATIONS REQUIRED BY INPI	FOREIGN	BRAZILIAN	TOTAL
Payment amount charged	4	2	6
Legal format of contract	2	3	5
Restrictive clauses deleted	-	2	2
Duration of contract	-	1	1
Equity as partial payment not permitted	-	1	1
No alterations required	5	13	18

It should be noted that 7 foreign and 4 Brazilian firms did not respond to this question. Of the 30 that responded, 18 cases (60%) were approved as submitted with no alterations and 12 cases (5 foreign, 7 Brazilian) required alterations. In 6 of the cases that required alterations the payment amount was reduced. In 5 of the cases, the legal format of the contract was changed to conform to INPI regulations without any changes in the substance of the agreement. In 2 agreements clauses restricting export activities were deleted. Finally, one case each was reported for changing the duration of the agreement and in prohibiting the use of equity as partial payment for the technology. The last case involving equity exchange for technology is particularly interesting. Although the equity exchange transaction was disallowed by INPI, pay-

ment was permitted and the supplier subsequently used part of the payment to purchase equity in the Brazilian firm. This perhaps points to another weakness in the control system. While INPI did not permit the exchange of equity for technology, there is no restriction on the inflow of foreign investment which merely has to be registered with the Central Bank. Hence a foreign technology supplier can invest the payment it receives for its technology in the receiving firm at any time as long as a 'gentlemen's agreement' has been worked out beforehand. In fact, this survey data revealed 5 cases where the foreign supplier became a minority shareholder in the Brazilian firm. An ex-official of INPI interviewed acknowledged this loophole and indicated that it would have been better if INPI permitted equity exchange so that it knows more completely what was being transacted. If the technology payment were later converted into foreign investment the transaction would only go through the Central Bank and without INPI's knowledge.

4.6.2 Assistance From INPI

Sections 4.6.2 to 4.6.4 are concerned with the firms' general experience in dealing with INPI and the Central Bank in technology transfer and are not restricted to the cases discussed before. Together 43 firms in the sample had submitted a total of 118 agreements to INPI since it began screening agreements in 1972. The dispositions of these agreements were as follows:

TABLE 4.37 DISPOSITION OF AGREEMENTS SUBMITTED TO INPI

DISPOSITION OF AGREEMENTS	FOREIGN	BRAZILIAN	TOTAL
Approved	40	55	95
Rejected	3	1	4
Alterations being negotiated	8	4	12
Being examined for first time	1	6	7
TOTAL NO. OF AGREEMENTS	52	66	118
TOTAL NO. OF FIRMS	20	23	43

There were 4 agreements that were rejected on the basis of the firms' non-compliance with INPI requirements. One firm attempted to renew an agreement for

more than five years and another firm attempted to register a trademark agreement for 15 years (regulation limit is 5 years). Another agreement was rejected on the basis that payments were not permitted between subsidiary and parent company for industrial property. Finally, one foreign firm merely replied that the rejection was due to non-compliance with what INPI required and would not comment further.

As for agreements which had alterations demanded by INPI, the type of alterations were as follows:

TABLE 4.38 ALTERATIONS REQUIRED BY INPI

TYPE OF ALTERATION (not mutually exclusive)	FOREIGN	BRAZILIAN	TOTAL
Payment	6	2	8
Duration of agreement	1	1	2
Restrictive clauses	3	2	5
Legal format of agreement	4	3	7

As far as assistance from INPI was concerned, 37 firms (19 foreign, 18 Brazilian) claimed they had never received any while 4 firms (1 foreign, 3 Brazilian) reported that INPI was helpful to them in negotiating with the foreign technology supplier. One Brazilian firm received some assistance in legal matters concerning the agreement. The other three firms claimed that INPI's intervention helped in the negotiations with the supplier and one of these firms claimed that the supplier accepted lower payments as a result. But these were incidental cases and by-products of the registration process as neither the firms actively sought nor INPI actively gave assistance as part of the institutional function.

4.6.3 Problems With Central Bank

When payments to the exterior are involved, a technology agreement must be registered with the Central Bank after it has been registered with INPI. It has been reported[1] that the key permission for technology purchase rests

[1] Siemsen, Peter Dirk, Licensing of Industrial Property and Transfer of Technology in Brazil, paper presented at Inter-American Association of Industrial Property Briefing Conference, Chicago, May 1975.

with INPI, as the registration with the Central Bank is practically automatic once approval from INPI has been granted. This was generally supported by the findings of this study. Thirty-two firms (80% of 40 firms that responded) reported they did not have any problems in registering their agreements with the Central Bank. Only 8 firms (5 foreign, 3 Brazilian) claimed they experienced delays in dealing with the Central Bank but all eventually obtained the registration. Six firms (3 foreign, 3 Brazilian) also encountered problems in documentations needed to obtain the foreign exchange authorization to remit the technology payments. All but one of these firms blamed the delays on the Bank's bureaucracy while one firm felt it lacked experience in the procedures. It should be noted that government bureaucracy and complex regulations and procedures concerning INPI, the Central Bank and CACEX were common complaints among the firms interviewed. To some extent, these complaints may be substantiated by two pieces of evidence. The first is that in the course of interviews conducted in this study, mid-level government officials who actually carried out the work had given confusing and conflicting descriptions of the control system. The second is that many of the firms relied on specialized personnel in dealing with government agencies. The larger firms had their own legal staff while the smaller ones frequently used 'despachantes' or quasi-legal firms that sell their services to clients who need help in processing documents through government agencies. It is interesting to note that the Venezuelan government is organizing courses in rules and procedures to be given by their counterpart to INPI for firms importing technology.

4.6.4 Government Inspection

Forty-two firms (18 foreign, 24 Brazilian) responded to whether there were any government audit or inspection concerning the technology they received and paid for under the agreements registered with INPI and the Central Bank. Forty firms (17 foreign, 23 Brazilian) reported there were never any inspections, although two of these firms (both foreign) had received visits from government officials not directly related to the technology transfer. One firm was visited by officials from the National Bank of Economic Development (BNDE) because the plant was constructed with financing from the Bank. Another firm was visited by CACEX officials who inspected the machinery that was imported. Only 2 firms, a Brazilian firm in chemicals and a foreign firm in mechanical equipment, had been visited by INPI officials subsequent to the registration of

the technology agreements. In both cases, the agreements were transfers of non-proprietory industrial secrets and payments were based on percentage of sales. In the first case, the officials examined the chemical formulae and the manufacturing process that were imported. In the second case, the officials inspected the physical production installations.

As is apparent, the post-transfer audit function of INPI and the Central Bank was extremely limited. This perhaps represents the biggest gap in the control system for technology transfer. Regardless of how thorough or sophisticated INPI makes its screening process prior to the registration of the agreements, much of these efforts would be quite futile if the control includes no follow-up evaluation or action. It would be impossible to determine the relationship between payments made and what was in fact transferred, or whether contractual conditions required by INPI were adhered to, or what base quantities were used for percentage-sales agreements. These problems are all the more relevant considering the fact that during the period 1972 to mid-1975, agreements between foreign subsidiaries and their related parties abroad account for 22.9% of all percentage-sales agreements and 30.7% of the payments approved by INPI for private firms (i.e. excluding government enterprises and entities). Needless to say, these transactions are more open to inter-firm manipulation than others. This potential problem is a significant one as it has been pointed out in Section 4.4 that decision-making concerning technology transactions frequently resides at the parent headquarter.

In response to what can demonstrate the transfer of technology, 36 firms suggested that several forms of physical evidence may be used. These included the examination of documents such as designs, blueprints, technical data and invoices, inspections of the product and the production facilities and the physical presence of foreign technicians. These are undoubtedly rather simplistic answers to a very complex question as to what can and should be inspected and audited in technology transfer. Nonetheless, the lack of post-auditing is a major weakness in the control system and an area that deserves much more attention.

4.6.5 Government Incentives

The following section refers to the cases specifically. Forty firms (18 foreign, 22 Brazilian) responded to whether the case of technology transfer was directly or indirectly related to the following types of fiscal incentive from the government:

TABLE 4.39 GOVERNMENT INCENTIVES RELATED TO THE TRANSFER

GOVERNMENT INCENTIVE	FOREIGN	BRAZILIAN	TOTAL
Tax and duty exemption for imported equipment	12	12	24
Tax and duty exemption for imported materials and parts	8	4	12
Export incentives	7	7	14
Government financing	2	6	8
Government as purchaser	2	1	3
No incentives	2	7	9
TOTAL NO. OF FIRMS	18	22	40

It appears that the majority of the technology transfer transactions (31 out of 40, or 77% of the cases) involved either directly or indirectly some form of government incentive. Only 9 firms (2 foreign, 7 Brazilian) had not solicited any government incentives. It is interesting to note that only 1 of these 9 firms may be considered large relative to its sector with all the rest being of small or medium size. Another study/1 conducted jointly by the Center for Policy Alternatives and the Fundação Carlos Alberto Vanzolini has also found that among firms in São Paulo larger firms had more access to government incentives.

For the 29 firms (14 foreign, 15 Brazilian) that had imported equipment as part of the technology transfer (see Section 4.3.2) 24 firms had obtained tax and duty exemptions (which can add up to about 50% of the purchase value). Two more firms (1 foreign, 1 Brazilian) had sought the exemptions but were re-

/1 Characteristics of Technological Change in the São Paulo Firm, André Ghirardi, Moysés Pluciennik and James M. Utterback, Center for Policy Alternatives Working Paper, Cambridge, April 1976.

jected on the basis that there were national similars to the imported equipment. The foreign firm acknowledged the existence of a national similar but claimed that the local manufacturer could not deliver fast enough. Fifteen (4 foreign, 11 Brazilian) of the 24 firms that had obtained the tax exemptions from CACEX reported they encountered no problems in meeting the requirements of the law of similars. Seven firms (5 foreign, 2 Brazilian) had problems and split their equipment purchase into part national and part foreign to obtain the exemptions.

The second most frequently obtained incentive was export incentives. Fourteen firms (7 foreign, 7 Brazilian) sought and obtained incentives for exporting the product that was involved in the technology transfer. However, it should be pointed out again that the technology transfers were primarily for servicing the domestic market as only 7 firms exported more than 5% of the product, and among them only one exported more than 10%.

The next category of incentives were tax and duty exemptions for imported parts and materials. Eight foreign and 4 Brazilian firms obtained these exemptions. There was another foreign firm that solicited these exemptions but was denied on the grounds of national similars.

In 8 of the 40 cases the firms had also obtained government financing in the form of loans from development banks for the investments for new plant facilities. Six of these are Brazilian firms. It should be noted that under Brazilian law foreign-controlled enterprises are denied access to long-term loans from government institutions unless the investment project is considered by CDI (Council of Industrial Development) of the Ministry of Industry and Commerce to be of national priority in economic development.

Finally, the role of the government as a purchaser in these cases of technology transfer was minimal. Only 3 firms, all of which are in the metallurgical sector, reported having government institutions as customers for the product involved in the technology transfer.

Chapter 5. Assessment of the Control System and its Implementation

Chapter 5. Assessment of the Control System and Its Implementation

Earlier in Chapter one it was hypothesized that (a) there are substantial gaps between stated objectives and implementation of the control system, and (b) the control system is less effective in dealing with local subsidiaries of foreign firms than with Brazilian-controlled local firms. Both hypotheses tend to be supported by evidence revealed in the last three chapters concerning the structure of the control system, the technology transfer agreements processed, and the behavior of the recipient firms under the system. The following discussion will reiterate and integrate some of the findings that led to this conclusion.

As described in section 2.2, the Industrial Property Code established by Presidential Decree Law No. 5.772 of December 1971 gave INPI the responsibility of "registering and regulating all acts and contracts of technology transfer". The broad objectives and guidelines that were established (see p. 6) will now be evaluated according to their implementation.

- To favor importation of technology over importation of capital or goods

Presumably this means INPI would prefer technology being transferred via armslength contractual agreements rather than through the channels of foreign direct investment and trade. However, as was pointed out in Chapter two, INPI has no jurisdiction over the import of foreign capital or goods, which are under the control of the Central Bank and CACEX (Bank of Brazil) respectively. In fact, the import of 'embodied' technology (i.e. capital goods like machinery and equipment) are also under CACEX's control, and not INPI's. As a rough indicator of the relative significance of the three areas of jurisdiction, Central Bank figures for 1974 showed actual technology payments of US$234 million, inflow of foreign direct investment of US$1,448 million, and imports of US$12.63 billion.

Besides the dispersion of control authority, INPI's implementation of this objective perhaps also suffers from Brazil's relatively open and encouraging policy towards foreign direct investment. The classic counter-example to this is perhaps Japan's policy up until the mid 60's of being extremely restrictive towards the import of foreign capital and goods, while actively promoting the transfer of technology to Japanese firms through licensing agreements. Easy

entry of foreign capital would reduce the incentive to license the technology to a locally-controlled firm.

Despite these major drawbacks, INPI does have a regulation that seems related to this objective. That is, INPI will not approve agreements whereby the foreign supplier receives equity shares in the recipient firm as payment for its technology (a sort of de facto direct investment). However, the survey shows that this was easily and frequently circumvented by the two parties involved through gentlemen's agreements whereby the technology payment received by the supplier is reinvested in the recipient firm by registering it as foreign capital with the Central Bank, thus bypassing INPI completely (see sections 4.4.7 and 4.6.1).

- To acquire technology instead of renting it
- To eliminate contractual or implicit restrictions for local absorption and dissemination
- To avoid secrecy clauses or prohibition to continue production after termination whereby know-how agreements become patents for unlimited terms
- To increase exports, particularly of industrial products, avoiding market limitations through trademark licensing

These guidelines are related in that INPI would like the recipient firms to have greater control over the transferred technology. Under these guidelines, INPI will not approve agreements that contain such restrictive clauses. In theory, this would eliminate some past abuses of restrictive control by the technology supplier. However, in practice, these measures tend to create unfavorable biases against Brazilian-controlled recipient firms. Since the technology supplier would lose some essential control and benefits resulting from selling the technology than would otherwise be the case, these conditions would tend to raise the price of the technology and/or reduce its availability to the locally-controlled firm (see, for example, arguments by Jack Behrman and Harvey Wallender in S. Holland 1976). The survey shows that foreign-controlled recipient firms obtain most of their technology from their parents (see 4.4.7), which also make most of the decisions concerning the transfers (see 4.4.5 and 4.4.6). Executives of several

MNC subsidiaries in the survey asserted these requirements are irrelevant in their cases when the parent companies exercise essential control (see 4.5.2). Even for some Brazilian-controlled firms obtaining technology at armslength, INPI's success in removing restrictive clauses from the contracts may not prevent implicit gentlemen's agreements of compromises between the two parties. In fact, the survey shows this indeed occurred (see 4.5.2).

- To evaluate the technology to be imported

This guideline is somewhat vague. Presumably it implies the evaluation of the benefits resulting from the transfer rather than the technology itself. However, INPI has not established systematic and objective criteria for such evaluations. Instead, it relies on the recipient firm's own assessment and forecast of the potential benefits from the technology transfer, which are submitted with the application for approval. How the information is actually used and costs/benefits weighted is not known. But the virtual absence of post-registration monitoring and auditing of actual results of transfer (see 4.6.4) casts doubts on the implementation of this objective. This study also found that INPI had only ten to twelve staff members, mostly economists and lawyers, who are responsible for screening about 1,500 agreements per year. It is perhaps not surprising that most of the firms interviewed complained about INPI's bureaucracy and the long time required for approval (see 4.6.1). This again raises the point of relative disadvantages of the Brazilian-controlled firm under the system. A foreign subsidiary can continue to receive technology from its parent company, and frequently does (see 4.2), when its agreement is pending before INPI. But it is unlikely that a Brazilian-controlled firm will get any technology from its supplier until the agreement and payment is approved.

- To strengthen the bargaining position of the national licensee

- To develop knowledge of available technological alternatives

These guidelines are related and are intended to assist the recipient firm directly. It should be noted that they are of little relevance to foreign-controlled firms, which this study shows rely mostly on their parents to choose and supply the technologies they need (see 4.4.4 to 4.4.6). For Brazilian-controlled recipient firms, promotional provisions like these (as opposed to the others which are restrictive in nature) are exactly what seem to be needed and helpful. The study shows that the internal technical activities,

the search and selection processes for technology suppliers are indeed weak and limited for these firms. However, after the regulations have been in force for four years, only 3 out of 25 Brazilian-controlled firms in the survey reported ever receiving any assistance from INPI (see 4.6.2). Practically none of the others had anything nice to say about INPI, which they claimed was primarily obstructionist. This is not surprising as INPI's intervention is mainly at the registration stage when the two parties have already concluded the agreement, and not at the pre-registration stage of search and negotiation. In fact, several of the Brazilian firms complained bitterly that they had to renegotiate their contracts because of INPI, thus losing precious lead time and market position.

As a related effort to accomplish this particular objective, there were talks at INPI in 1975 of setting up a technology databank that would help recipient firms develop knowledge of available technologies. It remains to be seen how successfully this will be implemented. Educated opinions seem to indicate that there are few technology databanks in existence that are useful, with the Russians operating one that may be an execption.

- To support the technological development of the national enterprise

This is another objective that is promotional in nature. The study offers some evidence that many Brazilian firms have poor internal technical capacity (see 4.1). However, after four years under the control system, it appeared that few looked to local sources (whether inhouse or from local research institutes) for technical assistance (see 4.1.1 and 4.4.1). Two other research projects conducted by MIT's Center for Policy Alternatives on Brazil confirm the general non-use of local technological facilities [1], the main reasons being that foreign technology frequently is proven, cheaper, and readily available whereas the research performed by local research institutes are not market or user-oriented. The implementation of this objective would thus put INPI in a rather conflicting position. If local development of technology is to be encouraged by restricting Brazilian firms' access to foreign technology, it may put them at a disadvantage relative to MNC subsidiaries which have their technologies readymade from their parents. If, however, INPI does not take a restrictive stance, there may not be a sufficient demand for local technology.

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[1] Stewart Butler, et al: Some Perspectives on Technological Research in Sao Paulo and Brazil, CPA/wp-75-20, 1975; and Andre Ghirardi, et al: Characteristics of Technological Change in the Sao Paulo Firms, CPA/wp-76-9, 1976.

- To reduce the costs of the technology to be imported

This study shows that state-controlled enterprises accounted for the lion's share of technology payments approved by INPI (see table 3.5). It would appear any serious efforts to reduce the cost of imported technology must include this group of firms as targets. This raises an important question about the extent to which INPI can really control the transactions originating from these giant and powerful enterprises. Ex-military officers appointed by the President often sit on the board of directors of these enterprises. Indeed, the whole question of the relationships between various groups of state technocrats in Brazil (planners, regulators, entrepreneurs, and bankers all played by the state) and the military in shaping the country's development is one worthy of major research.

The data also raises questions about INPI's effective control over foreign-controlled recipient firms. The average payment per agreement made by these firms to their parents for technical assistance are almost twenty times that between unrelated parties (row 1, columns 1 & 2 of table 3.5). This would seem to suggest transfer price manipulations. Furthermore, since Brazilian law prohibits royalty payments for patents and trademarks between subsidiary and parent (see 2.4), this would also seem to suggest that payments are still being made, but merely through another category of agreements. On the other hand, many foreign subsidiaries reported receiving technology from their parents without payments and technology agreements approved by INPI (see 4.2). This apparent paradox might be explained by that technology flows from parents to subsidiaries occur as local market opportunities for their products arise, and that technology payments, if applied for and approved, are merely one of the many intrafirm channels of transferring funds (e.g. profit remittances, interest payments, transfer pricing of intrafirm of parts, components and finished goods). Thus foreign subsidiaries can bypass INPI altogether if their parents choose to obtain remittances through other channels. In fact, intrafirm trade of unfinished and finished goods in dollar terms are many orders of magnitude of intrafirm technology payments. Technology payments and agreements submitted to INPI for approval may only be a standby and substitute channel if needed.

Once again, it seems that a rigorous implementation of this guideline would be biased against Brazilian-controlled firms, as they have fewer channels at their disposal to pay their technology suppliers. Furthermore, requiring

recipient firms to pay less for what they believe the imported technology is worth may simply reduce the incentive for the supplier to transfer the technology to these local firms and increase the attractiveness of directly exploiting the technology by setting up a subsidiary. This would be in direct contradiction with an earlier objective of wanting to encourage technology transfer through armslength contractual agreements rather than through foreign direct investment. Many Brazilian executives interviewed asserted they were the better judge of how much the technology is worth, and that INPI had neither the capacity to evaluate the technology nor the market potential. Given Brazil's relatively open and even encouraging policy towards foreign direct investment (see 2.1), one important impact of the control system may in fact put private Brazilian-controlled firms at a disadvantage vis-a-vis the already powerful state enterprises and MNC subsidiaries.

- To favor non-percentage payments for technical assistance, and when admitted, limiting the percentages

First it should be pointed out that the payment ceilings expressed as percentages of sales permitted by INPI are the same as the tax-deductibility ceilings established by the Ministry of Finance in 1958 and have not been revised since. Secondly, favoring non-percentage payments may create another disadvantage for Brazilian-controlled firms. Percentage payments are usually running payments based on sales, which means that the recipient firm pays according to the relative success of the technology in producing markets. The technology supplier presumably would have more incentive to ensure that the transfer is a success, which is of benefit to the recipient. In contrast, fixed payments may mean that the recipient firm bears most of the risk rather than the supplier, as payments would still have to be made regardless of the level of production and the relative success of the transfer. Thirdly, the data base of technology agreements reveals that INPI had approved many technical assistance agreements between foreign subsidiaries and their parent companies with payments expressed as percentage of sales. Many of these subsidiaries have very large sales in Brazil, and a partial list from the data base is presented in table 5.1.

TABLE 5.1

PARTIAL LIST OF FOREIGN SUBSIDIARIES HAVING PERCENTAGE-SALES AGREEMENTS WITH RELATED PARTIES

NAME OF BRAZILIAN SUBSIDIARY	1974 SALES* US$ Million	SECTOR	NAME AND COUNTRY OF PARENT COMPANY	
Volkswagen do Brasil	1162.9	Trans. Mat.	Volkswagen	(W. Germany)
General Motors do Brasil	619.9	Trans. Mat.	G.M.	(U.S.A.)
Pirelli S/A. Cia. Ind. Bras.	439.5	Rubber	Pirelli	(Italy)
Souza Cruz	387.0	Tobacco	Br. Am. Tobacco	(U.K.)
Cia. Sider. Belgo Mineira	222.7	Metallurgy	ARBED	(Luxembourg)
Bayer do Brasil	113.8	Chemicals	Bayer	(W. Germany)
Johnson & Johnson	112.1	Pharmaceuticals	J. & J.	(U.S.A.)
Brastemp S/A. Apar. Dom.	93.1	Elec. & Comm. Equip.	Whirlpool	(U.S.A.)
Cia. Vidra. Santa Marina	90.4	Nonmet. Min. Prod.	St. Gobain	(France)
Microlite S/A. Ind. Com.	55.9	Elec. & Comm. Equip.	Varta	(W. Germany)
Glasurit do Brasil	51.6	Chemicals	BASF	(W. Germany)
Champion Papel e Celulose	47.8	Paper & Pulp	Champion	(U.S.A.)
Sandoz do Brasil	41.0	Pharmaceuticals	Sandoz	(Switzerland)
Laboratório Lepetit	39.4	Pharmaceuticals	Dow	(U.S.A.)
Cia. Bras. de Estireno	38.5	Chemicals	Koppers	(U.S.A.)
Sharp do Brasil	36.6	Elec. & Comm. Equip.	Sharp	(Japan)
Ind. Quím. Farm. Schering	29.5	Pharmaceuticals	Schering	(U.S.A.)
Fiação Bras. Rayon	27.7	Textiles	Snia Viscosa	(Italy)
Howa do Brasil	25.0	Mechanical Equip.	Howa	(Japan)
Cia. Bras. Plásticos Koppers	24.2	Plastics	Koppers	(U.S.A.)
Hitachi Line Ind. Elét.	10.8	Elec. & Comm. Equip.	Hitachi	(Japan)
Pohlig Heckel do Brasil	10.5	Mechanical Equip.	Pohlig Heckel	(W. Germany)
Valvoline S/A. Lubri.	10.5	Chemicals	Valvoline	(U.S.A.)
Hatsuta do Brasil	10.0	Mechanical Equip.	Hatsuta	(Japan)
Laboratório Wander do Brasil	N.A.	Pharmaceuticals	Wander	(Switzerland)
Peterco do Nordeste	N.A.	Elec. & Comm. Equip.	Worthington	(U.S.A.)
Vidros Corning Bras.	N.A.	Nonmet. Min. Prod.	Corning	(U.S.A.)
Purina do Brasil	N.A.	Food Processing	Purina	(U.S.A.)
Avon Cosméticos	N.A.	Cosmetics	Avon	(U.S.A.)
Resinor	N.A.	Chemicals	Koppers	(U.S.A.)
Gavea Hotel. Turismo	N.A.	Tourism	Intercontinental	(U.S.A.)
São Paulo Hilton Hotel	N.A.	Tourism	Hilton	(U.S.A.)

SOURCE: Quem é Quem na Economia Brasileira, Visão, São Paulo, August 1975.
(Conversion at U.S.$1 = Cr$6.8)

- To maintain the present national interest by not discouraging the inflow of foreign investment and the real transfer of technology

This last stated objective is somewhat of an enigma. Does it imply that INPI is acknowledging some basic conflicts in Brazil's policy towards technology transfer and foreign investment; some inherent difficulties within the control system in dealing with the MNC's; a veiled threat of more restrictive measures towards foreign investment when the present national interest changes; or perhaps a deference to political realities in which the state has already accomodated the interests of the powerful MNC presence in Brazil?

These are complex questions with no simple answers. These issues, and the exploration of various explanations and implications of the implementation gap documented in this chapter, will be treated further in the forthcoming thesis of the author.

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Appendix 2.1

REMITTANCE AND DEDUCTIBILITY LIMITS FOR TECHNOLOGY PAYMENTS

Group I - Basic Industries

Type of Production	Percentage of Sales
1. Electrical energy	
a. Production and Distribution	5%
2. Fuels	
a. Petroleum and petroleum by-products	5%
3. Transportation	
a. Transportation by urban railroad	5%
4. Communications	5%
5. Transportation Material	
a. Automobiles, trucks and other vehicles	5%
b. Automobile parts	5%
c. Tires and inner tubes	5%
6. Fertilizers	5%
7. Basic chemical products	5%
8. Heavy metal industry	
a. Iron and steel	5%
b. Aluminum	5%
9. Electrical materials	
a. Transformers, dynamos and power generators	5%
b. Electric motors for industry	5%
c. Telephone equipment and apparatus, telegraph and signal equipment	5%
10. Miscellaneous materials	
a. Agricultural tractors and combines	5%
b. Equipment, parts and accessories for highway construction	5%

Type of Production	Percentage of Sales
c. Equipment, parts and accessories for extractive and processing industries	5%
11. Naval construction	
a. Ships	5%
b. Equipment for ships	5%
Group II - Essential Processing Industries	
1. Packing materials	4%
2. Food products	4%
3. Chemicals	4%
4. Pharmaceutical products	4%
5. Textiles, yarn and fibers	4%
6. Shoes and similar products	3.5%
7. Metal products	3.5%
8. Cement and asbestos products	3.5%
9. Electrical material	3%
10. Machinery and equipment	
a. Non-superfluous domestic machinery and apparatus	3%
b. Office machinery and equipment	3%
c. Scientific equipment	3%
11. Rubber and plastic articles	2%
12. Articles for hygiene and personal use	
a. Shaving articles	2%
b. Dentifrices	2%
c. Soap	2%
13. Other processing industries	1%

Appendix 3.1

Sources of Information for the Data Base

The Information used in preparing the data base of 4443 technology agreements came from the following source:

Revista da Propriedade Industrial, INPI, Rio de Janeiro, Issues No. 1—244, April 1972 to June 1975.

The information used in determining or verifying the sector, country of origin, relationship between suppliers and receivers, and the ownership of the receiving firms came from the following sources:

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